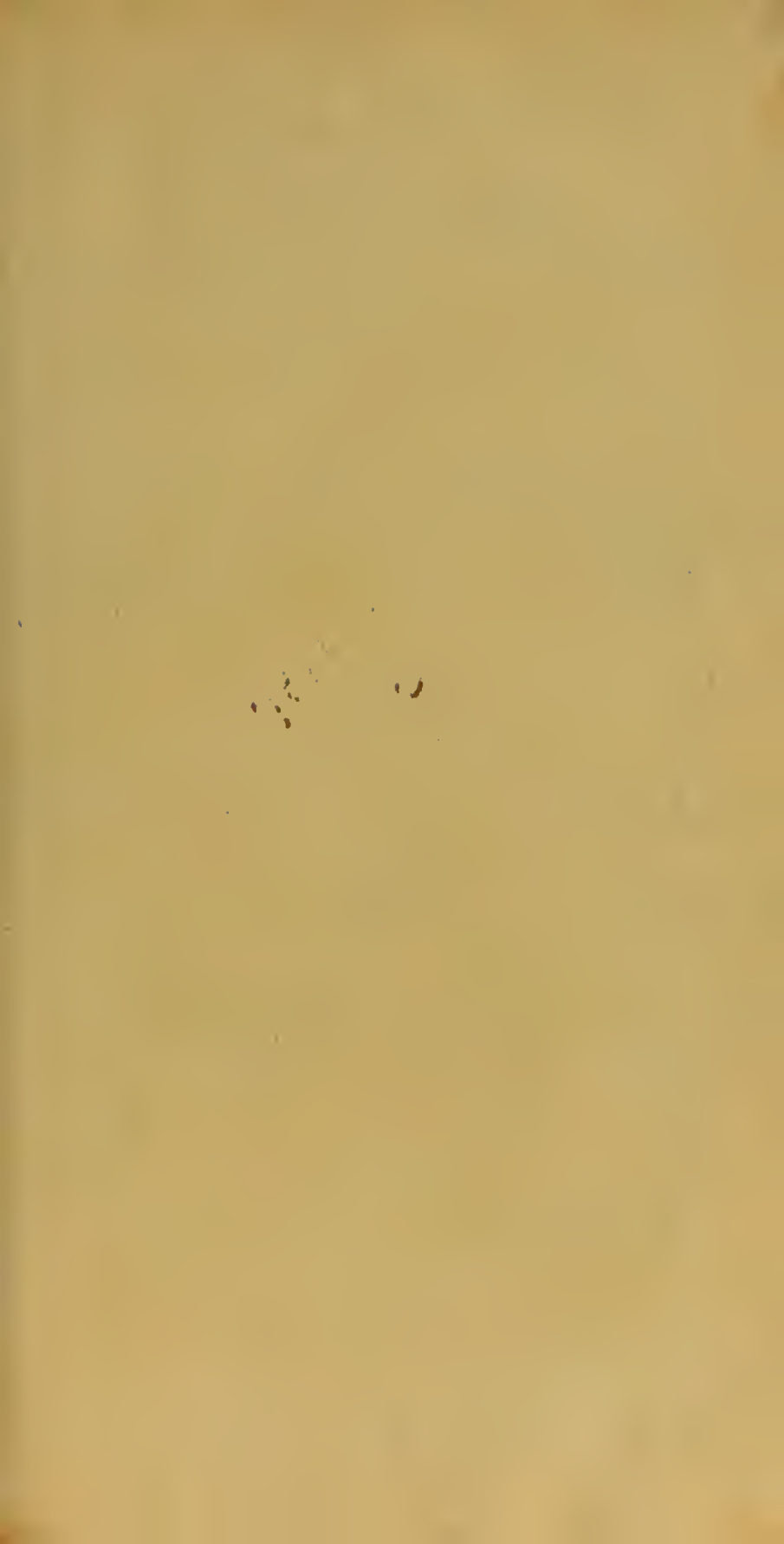




P 7/37.











OBSERVATIONS  
ON  
SOME IMPORTANT POINTS  
IN  
THE PRACTICE OF  
MILITARY SURGERY,

AND IN THE  
ARRANGEMENT AND POLICE

OF  
HOSPITALS.

ILLUSTRATED BY CASES AND DISSECTIONS.

BY JOHN HENNEN,  
DEPUTY INSPECTOR OF MILITARY HOSPITALS.

“ Je vais, dans les loisirs d'une paix, hélas ! trop 'incertaine, préparer,  
si je puis, de nouveaux secours aux guerriers.”

PERCY.

“ Hæc habui, candide Lector, quæ de nostro curandi modo tibi propo-  
nerem, excogitata quidem non temere, sed rationis ductu, comprobata non  
casu, sed usu.”

MAGATUS.

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1818.

1871

1872

TO  
SIR JAMES M'GRIGOR, KNT. M. D. F. R. S.  
PHYSICIAN EXTRAORDINARY TO HIS ROYAL HIGHNESS  
THE PRINCE REGENT, AND DIRECTOR GENERAL  
OF THE ARMY MEDICAL DEPARTMENT,  
&c. &c. &c.

SIR,

*N*UMEROUS obstacles have hitherto prevented the completion of the following pages. I for some time hesitated, whether I should ever obtrude them on the public ; but, from the moment that I had resolved to publish them, it was no longer a matter of doubt to whom I should inscribe the work.

You, Sir, in your various Official capacities, have uniformly presented to the Medical Officers of the British Army, an invaluable example, of zeal tempered by judgment, and of energy combined with prudence, while science has guided both ; and to the elevated station which you now fill, you have added the still higher distinction, of being looked up to as the father and friend of your department.

To you, therefore, I offer, as a memorial of grateful estimation, for public excellence and private worth, these " Observations,"

*a principal part of which have been suggested,  
from materials collected while employed under  
your orders, and supported by your encourage-  
ment.*

*I remain,*

*Sir,*

*with gratitude and respect,*

*Your faithful and devoted Servant,*

**JOHN HENNEN.**

**EDINBURGH, 1st January 1818.**

## PREFACE.

---

IT was my original intention to have illustrated some of the following pages, with engravings from drawings of many valuable preparations collected by myself and my friends ; but, after considerable progress had been made, I found that the expence would have seriously exceeded what I either wished or proposed, when I first announced my design of appearing before the public. Since that period also, a number of valuable cases have been sent to me, which have considerably augmented my materials. I therefore thought it much better, to supply the place of engravings, by letter-press description, than farther to enhance the price of a book, the object of which has been neither the acquisition of profit, nor the gratification of vanity. I



lament the want of engravings the less, that I have received many promises of assistance, in a collection of drawings, illustrative of the objects of Military Surgery, particularly from the spirited and accurate pencil of my friend, Staff-Surgeon Schetky; a selection from which, with appropriate explanations, may be submitted to the profession at some future period.

I cannot allow these "Observations" to be published, without expressing my sincere acknowledgments to the gentlemen who have, in the most handsome manner, given me the use of their preparations and their case-books. Mr Vance, of Haslar Royal Naval Hospital, allowed me constant access to his excellent specimens of morbid bones, and he rendered the permission still more valuable, by his numerous communications in illustration of every point on which I consulted him, during the period of my superintendence of the Portsmouth District: To Dr Denmark, also, I owed the use of many beautiful preparations during my residence there: Mr Hammick, of the Royal Naval Hospital of Plymouth, allowed me to examine the whole of his col-

lection, and offered me permission to make drawings of them: To those gentlemen, and to Drs Dickson and Johnson, of the same service, my sincere thanks are offered; but, much as I am indebted to the naval surgeons for any merit my book may possess, I could not presume to hold out in its title page, a promise of information upon a branch of the service, with which I was only acquainted by hearsay.

To some of my military friends, it will be seen that I owe considerable obligations; and I willingly take advantage of the present opportunity to offer my acknowledgments, particularly to the junior classes, who have served with me on various occasions, and whose zeal and personal exertions, have amply repaid me for my endeavours to acquire their friendship and confidence. To Dr Thomson, Surgeon to the Forces, and Regius Professor of Military Surgery in the University of Edinburgh, I am under great obligations. The value of his friendship has been particularly enhanced, by the numerous sources of information (not hitherto generally accessible to officers of the army) to which he

has directed my inquiries. The peculiar opportunities, however, which military surgeons now enjoy, facilitated as they are by the Director-General, opens a very wide field for improvement, and affords the promise of incalculable future benefit. Under these circumstances, therefore, I have referred much oftener to the works of the older surgeons, and of foreigners, than I otherwise would have done.

Circumstances, with which it is unnecessary to trouble the reader, have prevented that rigid correction of the press, opportunities and talents for which are enjoyed by more practised and more sedentary writers,—an omission, for which I beg to solicit indulgence.

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## ERRATA.

Page 25, line 24, *for were read are.*

- 31, 25, *for touched read torn.*
- 40, 19, *for bone read shaft.*
- 47, 3, *for vaccilating read vacillating.*
- 49, 4, *for opposition read apposition.*
- 53, 20, after witnessed, add “nor traced.”
- 54, 10th from bottom, after practice add “depends.”
- 56, 27, *for a read an.*
- 58, 13, *for patient read patients.*
- 62, 26, *for attendants read attendant.*
- 73, 1, *for formula read formulæ.*
- 79, Note, *for licet read liceat.*
- 109, 24, *for was read were.*
- 128, 22, *for postion read position.*
- 319, Note, add *Vide* also Volaire, Journ. de Med. Tom. 20, the patient surviving two years and a half. Sandisfort, Thes. Vol. III. Paroisse. Plouquet.
- 413, Note, after opinion, add “the canula.”

OBSERVATIONS  
ON  
SOME IMPORTANT POINTS  
OF  
MILITARY SURGERY, &c.

---

INTRODUCTORY REMARKS.

A VERY few years have elapsed since Military Surgery was at so low an ebb in England, that one of the most able and enthusiastic medical philosophers which the country ever produced, has made the following observations on the subject. “ Practice, “ not precept, seemed to be the guide of all who “ studied in this branch ; and, if we observe the “ practice hitherto pursued, we shall find it very con- “ fined, being hardly reduced to the common rules “ of surgery, and therefore it was hardly necessary “ for a man to be a surgeon to practise in the army.” This opinion of Mr Hunter, who was himself an army surgeon, little as it flatters his predecessors, was, to a great extent, founded on truth ; but if we come to investigate the cause of this deficiency



in practice, and this scantiness of precept, we shall be able easily to trace it to one of the most powerful springs of action implanted in the human mind. He must have been indeed possessed of a most glowing enthusiasm, and an utter contempt for self interest, who would have buried his talents and his industry in a situation where obscurity, poverty, and neglect, spread all their horrors before him. These were, for years, the portion of the army-surgeons ; their situation was looked upon as the lowest step of professional drudgery and degradation ; and if a man of superior merit by chance sprung up in it, or entered it for temporary purposes, he soon abandoned the employment for the more lucrative, the more respectable, and the less servile walk of private practice. The school was good ; but the best and most natural feelings of the human heart, were too deeply lacerated, to permit an independent man to continue long a pupil.

A brighter day has, however, dawned on Military Surgery ; encouragement has been held out to the active, the respectable, and the well educated ; and the country has been repaid for its judicious liberality, (tardy as it has been,) by the acceptance of its offers. It is to be hoped, that no petty jealousies, or ill-judged economy, may sap this fair foundation, and that a recollection of what has happened at the commencement of former wars, may guide our future statesmen.

The army surgeons of antiquity united in their



own persons the soldier and the physician, an union of which the writings of the earliest Greek poet give us frequent notice ; but history does not afford any positive or satisfactory accounts of the hospital establishments of former days. The institution of field hospitals appears to have taken place in the East about the sixth century ; and of the more permanent establishments for invalids, at Constantinople, in the end of the eleventh ; the learned Anna Comnena has given an account of this institution of her father, the Emperor Alexius. In those times, the knights attended the sick and wounded themselves, compounding balsams and vulnerary drinks for them with great spirit and perseverance, although with no pretensions to scientific accuracy ; for, according to Guy de Chauliac, they trusted to exorcisms, beverages, oil, wool, and cabbage leaves ! But the regular physicians and surgeons took the duties of the hospitals upon themselves in the early part of the fifteenth century, and were guided by a code of written regulations, and, it is to be hoped, by more scientific principles ; army surgery, however, remained in a very rude and neglected state, for many years after this period.

The illustrious Henri Quatre first established field hospitals in France, at the siege of Amiens in 1597,—a boon so grateful to the soldiers, that, by way of pre-eminence, they distinguished the cam-

paign in which they were instituted, by the title of "The velvet campaign." Humanity to the wounded, had, however, been a trait in the character of the French monarchs previous to these days; and St Louis himself, the ninth king of that name, did not disdain personally to assist in the cure of the soldiers, whose wounds were the consequences of the wars undertaken for the purpose of expelling the infidels from the Holy Land, or of his contests with our Henry III. To his lineal descendant, the hero of Navarre, was due a triumph of humanity greater than any achieved by his arms; he laid the first plan of an hospital for decayed and wounded soldiers, which the magnificence of Louis XIV. perfected into the present Hotel des Invalides, the same year in which the hospital for invalids at Chelsea was commenced by our James II.

Worthy in every respect of such a prince as Henry, was his surgeon and counsellor, Ambrose Paré, one of the earliest and best of army surgeons. He followed the French armies, which he first joined at Turin in 1536, in all their operations, down to the battle of Moncontour in 1569, which is the latest date I can find in his account of his campaigns. The state in which he found military surgery at his first entrance on its practice, may be guessed at by the very interesting account he gives of it in his 11th and 29th books; how he left it,

his invaluable works testify in every page ; these were all collected and published together by Guillemeau at Paris, in 1582. His “ *Maniere de traiter les Playes d’Arquebusades et Fleches*” had already appeared in a separate form in 1551.

Maggius published a work, “ *De Vulnere Bombardarum et Sclopetorum*,” at Bologna in 1552, and Alphonsus Ferrius followed on the same subject, the ensuing year at Lyons. Rota, a public lecturer at Bologna, published at that place a book entitled “ *De Tormentariorum Vulnerum Curatione et Natura*,” in the year 1555 ; and Leonardus Botallus, by far the best author of the Italian school, produced his work, “ *De Curandis Vulneribus Sclopetorum*,” at Lyons, in 1560. These authors, together with De Vigo, another Italian, and the Germans Hieronymus a Brunswich, and Gersdorf, who flourished prior to Paré, and J. Baptist Carcanus, the director of the Military Hospital at Milan, who published his excellent, original, but little known work, “ *De Vulneribus Capitis*,” in 1583, are among the principal early continental surgeons who have professedly written on, or incidentally treated of, military surgery ; a catalogue, the further extension of which would be of very doubtful utility, and which indeed embraces but a very few more names, and scarcely one of celebrity.

The earliest English military author of whose work I have any knowledge is Thomas Gale, who served as a surgeon in the army of Henry VIII. at

Montruil in 1544, and also in that of King Philip at St Quintin in 1557. He published the "Institution of a Chirurgeon," and, together with it and other tracts, a Treatise on Gunshot Wounds, London, 1563, 8vo. He refutes the opinion entertained by Hieronymus a Brunswich, De Vigo, Ferrius, and others, concerning the poisonous nature of gunpowder, and the actual unction produced by the ball. The general state of military surgery, however, was most deplorable in his day. William Clowes, a naval surgeon, who afterwards served in the army, published in 1591 "A proved practise for all young Chirurgians, concerning Burnings with Gunpowder, and Woundes made with Gunshot, Sword, Halberd, Pike, Launce, or such other." This was twice reprinted, with some variation in the title-page. Its principal merit consists in recommending mild dressings. Quercetan's "Sclopetarius" was translated and published at London in 1590 by John Hester, who also appears to have published a work entitled "Spagiricum Antidotarium contra Vulnera Sclopetaria." Peter Lowe may also be reckoned a military writer; he served for many years in France and Flanders in the wars of Henry IV. and published at London in 1612 "A Discourse on the whole art of Chirurgery," (2d edit.) wherein he treats of gunshot and other wounds. John Woodall, who accompanied the troops sent by Queen Elizabeth to France in 1589, and who also served in the navy in the East Indies,

and became Surgeon-General to the Company, published his “ Surgeons’ Mate, or Military and Domestique Surgery,” after the Queen’s death, but in what year I have not been able to ascertain. His “ Viaticum, or Pathway to the Surgeons’ Chest,” an appendix to the former work, was published in 1628. Both contain many useful practical facts, and evince considerable learning and great humanity. Paré’s book on Gunshot wounds appears to have been previously translated into our language by Hammond, in 1617. Richard Wiseman published his “ Eight Chirurgical Treatises,” in 1676, one of which is expressly on gunshot wounds. His book abounds in valuable facts, collected from his practice both in the military and naval service of his country, and as a reward for these services, he was appointed Sergeant-Chirurgion to King Charles II. John Brown, sworn Chirurgion in Ordinary to Charles, published “ A complete Discourse of Wounds, both in general and particular, as also a treatise of Gunshot Wounds in general,” at London, in 1678, a very learned work, deduced from his practice in the navy in the Dutch war of 1665, in which he was severely wounded. Ranby, who filled the situation of Principal Sergeant-Surgeon to His Majesty King George II., and who attended that prince in his campaigns on the Continent, and particularly at the battle of Dettingen, published a small treatise in 1744, entitled “ The Method of Treating Gunshot Wounds.” His professed object in this work was, to recommend plentiful and early bleed-



ing, together with light easy dressings ; to banish from the republic of surgery the extravagant use of instruments, “ and, above all, to introduce the signal use of the bark.”

In the year 1718, Heister published at Nuremberg, his “General System of Surgery,” in German, which soon after appeared in an English translation. The first book of this work is dedicated entirely to wounds ; and his third chapter treats exclusively of those by gunshot. He had qualified himself for the task, by serving in the war of 1707 between the French and Dutch in Flanders ; Richter and Schnucker are the best practical German authors who have followed him upon the subject of Military Surgery, and are both of high and deserved celebrity.

The French authors Le Dran, Faudacq, and Le Cat, had, early in the eighteenth century, published their works “ *ex professo*” on gunshot wounds, and Poissonier, Desport, Ravaton, and Thomassin followed them in a few years afterwards. To enumerate all the other writers that have treated on military surgery in France, would be more the subject of a treatise than a sketch ; but it would be unpardonable not to mention the various papers on the subject which have appeared in that splendid monument of science, the “Memoirs of the French Academy of Surgery,” through which most valuable facts and observations are profusely scattered. The Revolution has produced some most able men and excellent writers ;

among them, Baron Percy, who published, in 1792, his little book, which he modestly styles a “*Manuel*,” but which is conspicuous for learning and solid judgment; and Baron Larrey, who published his “*Relation Historiques*” in 1803, and his “*Memoires*” in 1812, works, the product of extensive military experience, and great professional enthusiasm. Assalini in Italy, has also furnished us with an ingenious little volume published at Milan in 1812, his “*Manuale di Chirurgia*,” in which he treats of gunshot wounds; and M. Paroisse, surgeon to Jerome Napoleon, late king of Naples, has given some interesting observations on military surgery in his “*Opuscules de Chirurgie*,” which appeared at Paris in 1806.

In England, within the period of the French Revolution, few practical surgeons have written exclusively on military surgery. One towering genius has touched upon it, as a part of that immortal monument which he has raised to his own fame, and to the glory of the British surgical name in the “*Treatise on the Blood, Inflammation, and Gunshot Wounds*.” This great work of Mr John Hunter’s was published in 1794, after his death. The materials were collected during a period of active service abroad, whither he went as senior Staff-surgeon in the year 1760, and served at Belleisle and in Portugal for the remainder of the war. In the year 1790, he was appointed to the joint offices of Surgeon-General to the army, and Inspector of Regimental Infirmaries; and in con-



junction with the Physician-General, Sir Clifton Wintringham, held the superintendence of the department. Staff-surgeons, as well as Physicians, were, at this period, and for many years before, selected from civil life on the spur of any expedition, and very rarely from the regimental surgeons. The names of Pringle, Brocklesby, and Monro, survive in their works ; but, previous to the time of Mr Hunter, no publication with which I am acquainted was produced by the staff or regimental surgeons ; although the appointment of the latter was coeval with their corps, and many of them had consequently, ample opportunities for observation. On the lamented death of Mr Hunter, a board was formed, which dates from his present Majesty's order, issued through the Secretary at War, in October 1793. This consisted of a Physician-General, a Surgeon-General, and an Inspector of Regimental Infirmaries, who were invested with distinct but jarring powers, and continued to act until 1808, when it was dissolved, and new modelled, upon the basis of responsibility as a body, which was constituted of a Director-General and two Principal Inspectors. On the peace establishment of 1817, the two latter officers ceased to be borne on the returns of the staff of the army, but in the army-list of January 1818, the appointment of a Deputy-Director-General appears.

The circumstances of a long war gave rise to many divisions of rank among the officers of the medical staff ; but several of these were abolish-

ed by the King's warrant in 1804 ; and the Staff is now composed of a certain number of Inspectors and Deputies, Physicians, Surgeons, Apothecaries, Assistant-surgeons, and Hospital-assistants, with commissions, and of some Hospital mates and Dispensers, who hold their situations by warrant.

During these numerous changes in the department, which, it must be confessed, were loudly called for by the circumstances of the times, very little indeed was done for the sciences of Army Medicine and Surgery ; and those who were best qualified by experience to write upon these subjects, were the last to employ their talents in publishing the fruit of their observations. The natural consequence of this was, that when young men entered the service of their country, they had no practical guides to point out to them the peculiarities of the situation, and the habits, constitutions, and accidents, of that class of men, whose health and lives were entrusted to their care. But the increasing demand for medical officers for the armies, naturally stimulated the public lecturers, and the professed writers, to turn their attention to those points which more peculiarly concerned that class of their hearers and readers. Many ponderous " tomes " were therefore dragged from their dusty abodes, and, with the aid of a few cases which an accident, a duel, or a volunteer field-day, occasionally supplied, systems were formed. This was

quite sufficient for the men of established character in settled practice ; but it became necessary to do something more, to satisfy the increasing demands of the public service, and the practice of the great naval and military hospitals at home, furnished a source of secondary information on these points ; while few, if any, of the public teachers had ever been in the service, or had treated a series of military accidents from their infliction to their termination. In place of practical facts, therefore, the ingenuity of conjecture and the poignancy of wit, were occasionally called into action ; the army surgeons, whose multifarious employments did not permit them to write, were hinted at as ignorant “ routiniers ;” while they were acquiring knowledge in the volume of nature, the lecture-room and the press poured forth the fabrications of imagination ; the modesty and forbearance of those who were really qualified to instruct, were construed into inability ; and some teachers and writers, without taking time to deliberate, or even without having data to deliberate on, were they so inclined, essayed to involve in promiscuous reprehension the whole body of army practitioners, and held them up to derision and contempt : imitating the example of those critics, who, to use the language of a celebrated author, in his “ Tale of a Tub,” “ by long digressions unsought for, and universal censures unprovoked, have forced into the light, “ with much pains and dexterity, their own excel-

“ lencies, and other men’s faults, with great justice  
 “ to themselves, and candour to those they criti-  
 “ cise.” The “ *Lites Chirurgiæ*” have been already  
 too numerous. It has been too long the practice of  
 the members of the liberal professions to allow dif-  
 ferences of this kind to degenerate into personal  
 illiberalties, and the taste of the age seems to  
 strengthen the tendency. How melancholy, that  
 the professors of a science, whose legitimate ob-  
 jects are the happiness and comfort of mankind,  
 should be foremost in this race of ribaldry !

The various periodical works with which the  
 present day abounds, furnish numerous detached  
 papers and cases connected with military surgery ;  
 but Mr John Bell is the first, in point of time,  
 among the living authors, who has paid particular  
 attention to it, in his well known “ *Discourses up-  
 on Wounds.*” He was followed by Mr Chevalier,  
 who published a small volume on “ *Gunshot  
 Wounds ;*” which, in the form of an essay, gained  
 the prize given by the Royal College of Surgeons  
 of London for the year 1803. Mr Charles Bell,  
 in his “ *System of Operative Surgery,*” has also  
 enlarged upon many points of military surgery ;  
 and, in his second edition, has incorporated a  
 Treatise on Gunshot wounds, which is also pub-  
 lished in a separate form. Mr Guthrie, from his  
 extensive practice in the Peninsular war, has add-  
 ed a valuable work to military surgery, in his book  
 “ *on Gunshot Injuries of the Extremities Requir-*

ing Amputation," &c. ; and Dr Thomson, Regius Professor of military surgery in the University of Edinburgh, has furnished us with a faithful " Report of the state of the wounded in Belgium after the battle of Waterloo ;" while Mr Hutchison has given us a Series of Reports on the Surgical Results of the great action at Algiers, preceded by some observations connected with naval surgery.

The following observations, which insensibly grew upon me to their present bulk, are the results of an active military life since the first year of the present century, a very small portion only of which has been unoccupied by the study and the actual practice of military surgery,—in the Mediterranean ; throughout the whole of the Peninsular campaigns ; in the hospitals of France ; and, lastly, from the very commencement to the termination of that short but bloody campaign, which has for a time settled the fate of Europe, during which the charge of a very large hospital establishment, and the general superintendence of the wounded staff and regimental officers, were specially entrusted to me.

To collect, or even to enumerate, all the different injuries inflicted in war, would occupy a lifetime ; their direction and their importance vary from a number of causes dependent on the circumstances or the situation of the contending parties ; and it is much to be questioned, whether the most elaborate description of individual cases, where they



are not distinguished by some illustrative peculiarities, do not tend rather to confound than instruct the reader. To these, therefore, I have confined myself; and it is but reasonable to suppose, that, with a knowledge of the more important species of injuries, little difficulty will be experienced in treating any of the lesser that may occur. A system, it is true, would not have been complete without a special enumeration; but, in what I offer to the profession, I state principally what I have seen, without aiming at embracing all that has been seen by others. In the situation which I now hold, encouraged by the opinions of some of my friends, and influenced by the recollection of how much I lamented the want of such a guide myself, I have considered it my duty to arrange my notes, and to present them to the junior army surgeons, and to those in civil life who may wish to be informed with regard to the present state of military surgery.

At the termination of a series of wars, which, for a large portion of a century have desolated the fairest regions of the European world, and drenched their fields in blood, the medical philanthropist will naturally ask, what results have accrued from such ample sources of experience? What progress has been made in softening the miseries of pain and disease, and in extracting from such multitudes of victims, antidotes to the waste of human life? The younger practitioner also, who may enter the ser-

vice of his country, will inquire, where am I to collect the fruit of that experience, with which so many campaigns have enriched my predecessors? and how, if the opportunities come within my reach, am I best to avail myself of them? It is in some degree to answer these interrogatories, that I have ventured to make the following observations. In arranging them, I have carefully availed myself of the written and oral remarks of the best army surgeons, both domestic and foreign, to whose works or conversation I have had access, or who have had more experience than myself. I have studiously avoided controversial discussions, where they could lead to no practical results; and theory, unsupported by experience, I have altogether rejected; well knowing how much the young practitioner has to unlearn at the patient's bed-side, when he comes there fraught with opinions acquired from books or lectures only. With this in view, I have given the accompanying cases, nearly as they were taken down in large hospitals, or private practice, without, however, embarrassing them with trivial diurnal occurrences, which would only have enlarged the narrative, without adding to its value.

To those who have experienced how much of their patients' safety, and their own comfort, depends upon accuracy of arrangement, and strict attention to minutiae apparently trifling, I shall make no apology, for many of my observations on field and hospital management and police; and I have



have no doubt that a short acquaintance with military practice will render this excusable in the opinion of those commencing it.

The system of subordination and progressive responsibility, which is of such vital consequence in all military establishments, is in none of greater importance than in military hospitals. While it throws up the most secure barrier against disease, by the enforcement of well-digested regulations, it ensures the prompt and vigorous treatment of the sick soldier, and affords facilities to his professional attendant, which no other situation possibly can, of adding to the general stock of knowledge. The surgeon is indeed, from the very nature of his profession, less fettered by the letter of military law, but by no means less amenable to its spirit, than other classes of officers; and while the desire of investigation is kept alive, by the frequent opportunities of indulging it, the rashness of inexperience and the crudeness of theory are restrained, by the gradations of rank and seniority.

It is not, however, by a cold and servile performance of his duties, that the military surgeon will acquit himself with individual credit or public benefit; he must, to the habits of subordination, add professional enthusiasm:—not that ungoverned impulse which catches at the ephemeral proposals of empty theorists, or self-

dubbed reformers, but that regulated and chastened zeal which has real and useful acquirement for its object, and which, while it strengthens and increases his own powers and resources, gives him confidence in his principles, and an honest independence in their application. Thus constituted, the mind will soon adapt itself to the peculiarities of any situation, however difficult or novel, in which its possessor may be placed : and if his professional duties are less splendid, and the termination of his labours more distant, than those of his purely military associates ; yet, in the scale of general good, he will stand on fully as high and honourable grounds as they do.

As the entrance of a young man into the service presupposes and indeed ensures an acquaintance with the theoretical part of medicine and surgery, as taught in the Schools, I have, in the following sketches, introduced him at once to the field of battle, and thence to the patient's bedside, in the fixed hospitals ; but I must previously remind him, that many operations become indispensable in these situations, which may well be deferred, if not altogether avoided in private life, or in military patients placed under different circumstances. This will sufficiently account for many discordant opinions, particularly upon the subject of amputation.

## PREPARATORY STEPS ON TAKING THE FIELD.

TO ENABLE the young army surgeon the more effectually to apply his professional talents to the relief of the suffering soldier, it will be necessary to direct his attention to some preliminary points, which can be derived from field practice alone ; and, without a due observation of which, his best regulated plans and most zealous endeavours to do good will often end in severe and sometimes fatal disappointment. Were he to be always under the eye of his more experienced seniors, it would be superfluous to dwell on these points ; but the exigencies or the casualties of actual service will often throw him at a distance from all professional aid, and leave him totally dependant on the resources of his own mind, and on the scanty supplies to which original deficiency or subsequent expenditure will frequently reduce him. In this point the military surgeon is far less favourably circumstanced than his naval brethren. Their hospitals, their medical stores, their provisions, and all their little comforts, are as perfectly within their reach, after the most protracted engagement, as if no such event had taken place ; their patients suffer none of the heart-rending privations of a soldier, lying wounded on the field of battle,

without bedding, food, or shelter ; and, when he is removed, torn from his comrades, and sent to distant hospitals by a precarious and uncomfortable conveyance, over broken-up roads, or intricate mountain passes. In short, the sailor fights at home. Could a general fix upon his own ground, the medical officer, at the head of his staff, could easily determine on the necessary buildings for the sick and the wounded : but their shelter and their conveyance are inseparably connected with the movements of their commanders, and with the facilities of transport which the seat of war may afford, and the commissariat can procure, in addition to the unemployed cavalry and waggons of the army.

The supply of hospital stores, which should accompany an expedition, rests in the hands of those who immediately communicate with the government ; and has seldom heretofore been, and it is to be hoped and believed never will hereafter be, deficient, either in its quantity or its selection. In apportioning it off, however, to the various divisions or corps of an army, or to the different stationary hospitals, great attention and discrimination are necessary ; and the skill and experience of a medical officer are in few particulars more strongly evinced, than in making his requisitions on the great dépôts, for his field and hospital supplies, with judgment and selection. With this in his view, the first and



peculiar care of the medical officer, on commencing a campaign, should be carefully and minutely to examine his Medical and Purveyor's stores, with a view to their completion in every respect. Whether in charge of a corps of the army, of a regiment, or of a detachment, so much of the success of the Surgical Campaign depends upon this, that too great pains cannot be bestowed upon it. He should therefore, however circumstanced, calculate his mode and quantity of transport, as well as the comparative necessity or utility of different articles of medicines, instruments, surgical materials, bedding, utensils, and medical comforts necessary for his situation. If the articles are to be supplied on a large scale, the estimate will be best made by a board of intelligent and experienced Medical Officers ; and by no means should it be left at the discretion of an Apothecary or Purveyor, who cannot be supposed to be adequate judges of what are necessary on those occasions. For want of this precaution, I have more than once seen whole cart-loads of useless rubbish put in requisition to be forwarded to the army, while the most necessary articles for the field were lumbering the stores of the depôts.

Indisputably, the best mode of packing stores for the field, will be, either in wicker baskets covered with skins or leather, fitted for carriage on horses' or mules' backs, and commonly called

*field panniers* ; or in wooden boxes, of such a size as may easily be adapted to a similar mode of conveyance ; and instead of filling several of those with duplicates of the same articles, a small proportion of each of the most indispensable medicines and materials ought to be placed in each pair of panniers, or boxes, and an invoice of the contents of each be pasted within the lids. Inconsiderable as this precaution may appear, the additional trouble it gives to the packer is amply compensated by the convenience and utility to the medical officers in the field.

Each Regimental or Staff Surgeon is allowed by the government a horse or mule, or its full price, with a pair of field panniers and pack-saddle, and its appurtenances, for the carriage of his field stores. The articles of the latter description generally served to the army, from their weight, clumsiness, and bad finish, completely defeat the purpose for which they are designed ; and no animal can carry the necessary load for the shortest march without injury to his back, sometimes so irretrievable as to render him utterly useless for the remainder of a campaign. No pains should therefore be spared to render the pack-saddle as light, pliable, and easy to the animal as possible ; and, when in movement, accurately to balance the panniers, and reduce the load within a moderate bulk. To these ordinary articles of equipment, a few bearers, a



camp kettle, a camp stool, and a water bucket, will be found most useful additions.

Foreign armies often allow carts and waggons for the carriage of what they denominate their field hospital: but the improved plan of British equipment does not recognize them on the line of march, and only a proportion of spring waggons, for the use of each division, is allowed to accompany the army; and that solely for carrying the sick and wounded. It does not enter into my plan, at present, to enlarge upon the *ambulance volante* of the French armies, described at such length by M. Larrey, and found so useful; although an establishment of that kind, duly modelled, would no doubt be of important service in our field arrangement. I shall therefore confine myself to some hints on the employment of the transport, and the selection of the stores usually allowed by the British regulations\*.

\* Vide Larrey's *Memoires de Chirurgie Militaire*, passim. The *ambulance volante* can be traced, by some faint vestiges, to a period so far back as the sixth century; when the Emperor Mauritius carried along with his army *Despotati*, or *δαίποτατοι*, (Drink-givers in the barbarous Greek of the middle ages,) whose duty it was to carry off the wounded in battle; for which purpose they were distributed among the cavalry, and were equipped with two stirrups on the left side of their saddles, to take up the wounded behind them with the greater ease, and were obliged to carry with them water for the refreshment of the sufferers. In the ninth century, the Emperor Leo VI., in his *Tactics*, mentions them expressly as a necessary

Lint, surgeon's tow, sponges, linen both loose and in rollers, silk and wax for ligatures, pins, tape, thread, needles, adhesive plaster ready spread and also in rolls, opium both solid and in tincture, submuriate of mercury, antimonials, sulphate of magnesia, volatile alkali, oil of turpentine, &c. &c. are among the articles of indispensable necessity in the panniers ; and, perhaps, as useful an article of convenience as the surgeon can possess, is a supply of wax candles, with phosphoric matches, or some other contrivance for procuring instant light ; for want of which, I have known some very distressing accidents occur : in one case in particular, several months of the patient's life were rendered uncomfortable by including a large plexus of nerves in the ligature. Every surgeon will naturally have the best instruments he can procure ; but it may not be amiss to remind him that his knives will often

appendage to an army, furnished with their field medicines and materials. In the fifteenth century the field surgeons came into some note ; they were principally attached to the general officers, and, although obliged to act as combatants, received a certain portion of booty and prisoners. The field surgeon of Henry V. of England (Nicholas Colnet) received a yearly sum of forty marks, in addition to his share of plunder ; but Nicholas had to furnish three archers ; and if his booty exceeded twenty pounds, he was to give up one third to his Majesty.—Vide Beckman's History of Inventions, by Johnson, vol. iv. 2d Edition. London, 1814. Article, Infirmaries, &c. page 467 ; and particularly the article " Despotat" in the French Dictionary of Medical Sciences.

loosen, and his scalpels, more particularly, break from their handles, if not firmly riveted, in through at least the half of their length ; an indispensable addition to his case will be a good strop to touch them on when blunted. The Hone sometimes put into cases is of but little use, as it requires an acquaintance with the peculiar mode of using it, without which the instruments are often totally spoiled : he should have one or two spare blades to his saws, and a set of Hey's saws, which are now usually put in by the instrument-makers ; and if the chain-saw, invented by Professor Jeffray, of Glasgow, were substituted for, or added to, the metacarpal saw, I conceive it would be an addition of serious importance\*. The straps of the screw tourniquet, usually put in instrument cases, are often defective, and their buckles unsafe. They should be carefully proved before using, lest they should give way at a critical period of an operation. The clumsy pieces of leather added to some are entirely useless ; but a neat, small pad, secured with a bit of tape, may be retained ; and if the handles were rounded, and properly padded, as recommended by one of the most experienced field surgeons of our day, Mr. Guthrie,

\* Vide Cases of the Excision of Carious Joints, by H. Park and P. F. Moreau ; with Observations by James Jeffray, M.D., Glasgow, 1806.

nothing else will be wanting to command the arteries in the shoulder-joint operations, for the very few seconds that they require pressure. The bullet-forceps in general use might also be improved, by being rendered less bulky, and its blades made to separate occasionally, and join, as in the midwifery forceps ; or the very useful forceps of M. Percy substituted in its stead\*.

To keep his instruments in perfect and serviceable order, must be the wish of every surgeon. Some wrap them in lint, or bibulous paper ; some dust them with absorbent powders, as starch or magnesia ; others smear them with mercurial ointment ; and some with simple oil, as fresh as they can procure it. The latter carefully applied, and afterwards gently rubbed off, I myself prefer to all other modes ; but whatever precaution is adopted, the instruments should be frequently examined, and the case covered with patent leather, or some other water-proof substance, and the whole loading of the baggage animal carefully covered with painted canvas.

About his own person each medical man, of course, carries a pocket case of instruments ; and I would strenuously recommend that he never omits a canteen of good wine, or spirits

\* Manuel du Chirurgien d'Armée, par M. Percy, Paris, 1792.



diluted. Many men sink beyond recovery for want of a timely cordial before, during, and after operations ; and many of the primary operations would be rendered much more favourable in their results, by the administration of a single glass of wine.

It is usual also to issue a certain number of what are called field tourniquets to the officers, and to some of the non-commissioned officers, drummers, and other non-combatants. In many instances life has been preserved by these instruments ; but too great caution cannot be employed in guarding against superfluous or long-continued pressure ; and the attendants, as well as the wounded individuals, should be warned to apply as soon as possible to the medical assistants, in order that they may examine the state of the parts in which the circulation is confined.

As the staff and regimental pannier mules or horses should never be overloaded, and as there is often a necessity for taking on forage for the use of the animals, the supply of materials must be limited to a certain weight ; two hundred pounds, including instruments, panniers, and barley, &c. &c. should be, in general, the maximum. The duty of having in readiness a reserve supply is one of the most serious importance ; this, however, as always devolving on

the head of the medical staff, who must be supposed perfectly prepared for all contingencies, it is unnecessary to enlarge upon here. The most portable articles of medicines, and materials; of medical comforts, as tea, sugar, wine, chocolate, portable soup, lemon juice, &c. ; the least cumbersome cooking apparatus, and some necessary articles of bedding, must, of course, constitute the store.

The distribution also of the various ranks of medical officers to the different corps, divisions, and brigades of the army, rests with the same authority; and however superfluous the number of professional men may appear *before a battle* or a series of movements, it will very seldom be a source of complaint after these operations. In the selection of field necessities, and of Staff, circumstances of course must very materially influence every arrangement.

We shall suppose, however, that the army has taken the field, or opened the trenches; each of its divisions furnished with a due proportion of the general Hospital Staff with their stores; the field panniers of the regiments and of the Staff-surgeons complete; their surgeons and assistants present; and an arrangement made with the Commissariat for the transport of the wounded to the fixed hospitals in the rear. The usual and most rational plan of providing against the casualties that will naturally succeed to the



opening of the fire in the field, is that laid down by Ranby\* ; viz. to form in small parties, at a convenient distance in the rear, out of the immediate reach of shot and shells, where the field panniers are fixed as a sort of table, and where some of the regimental non-combatants, the drummers, band, &c. are prepared to act as orderlies. Where, however, it can be conveniently done, especially at a siege, two, three, or more points of rendezvous, at a house, farm, church, or marquee, ought to be appointed to carry the wounded to in the first instance. In either of these situations the first dressings ought to be applied, and the primary operations performed ; here, also, the wounded should be selected for conveyance to the receiving hospitals in the rear ; those who can walk selected from those who require mules, horses, or waggon, and the whole sent off under a proper escort, and with a careful assistant, in such proportions as the nature of circumstances may point out, and with a due supply of rations. Every article, however, of this kind, particularly spirits or wine, is to be kept on a separate waggon or mule, and never entrusted to the soldiers. The most clamorous and most troublesome wounded in the field, or before the walls of a besieged town, are generally the worst characters, and the most

\* Method of treating Gun-shot Wounds, London, 1744.

slightly injured of the army. Great discrimination, therefore, should be used in placing them in the carts, or on the mules destined to carry them to the nearest hospital. Several even affect being contused, or stunned by the recoil of their pieces, or the wind of the balls or shells ; their object being too frequently plunder ; in pursuit of which, the rations and medical comforts of their suffering fellow-soldiers are often the first object of their cupidity.

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GENERAL NATURE AND FIRST TREATMENT OF WOUNDS,  
COURSE OF BALLS, &c.

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AMONG the antient surgeons, who had learned and abstruse theories to support, respecting the “burnings,” and “the poisonings,” and “the concussions,” of gun-shot wounds, every little accidental variation in the external appearance of the shot-hole, and every shade of mental agitation in the wounded man, was fondly dwelt on as illustrative of their own particular doctrine ; and, even to the present hour, some writers enlarge on these appearances, as if they were at all essential to the treatment ; and puzzle them-

selves with definitions, as if every practitioner acquainted with the subject, even from books, did not know that a gun-shot injury is a violent contusion, with or without solution of continuity, suddenly and rapidly effected by a solid body projected from fire arms, and nothing more, as far, at least, as definition is concerned.

The effects of a gun-shot wound differ so materially in different men, and the appearances are so various, according to the nature of the part wounded, and the greater or lesser force with which it has been struck, that no invariable train of symptoms can justly be described as its necessary concomitants. If a musket or pistol ball has struck a fleshy part, without injuring any material blood-vessel, we see a hole about the size of, or smaller than, the bullet itself, with a discoloured lip, forced inwards ; and, if it has passed through the parts, an everted edge, and a more ragged and larger orifice at the point of its exit ; the hæmorrhage very slight, and the pain inconsiderable, insomuch, that in many instances the wounded man is not aware of his having received any injury. If, however, the ball has touched a large vessel or nerve, the hæmorrhage will be profuse, or the pain of the wound severe, and the power of the part lost. Some men will have a limb carried off, or shattered to pieces, by a cannon ball, without exhibiting the slightest symptoms of mental or

corporeal agitation ; nay, even without being conscious of the occurrence ; and when they are, they will coolly argue on the probable result of the injury : while a deadly paleness, instant vomiting, profuse perspiration, and universal tremor, will seize another on the receipt of a slight flesh wound. This tremor, which has been so much talked of, and which to an inexperienced eye is really terrifying, is soon relieved by a mouthful of wine or spirits, or by an opiate ; but, above all, by the tenderness and sympathizing manner of the surgeon, and his assurances of his patient's safety. If the ball has passed through the fleshy part of the arm, thigh, or buttock, we do no more than sponge the part clean, place a small bit of folded lint on each orifice, which we retain by two cross slips of adhesive plaster, and lay over two or three turns of a roller. The ball will frequently have passed nearly through the limb, and be retained only by the elasticity of the common integuments. There we cut upon, and extract it at once ; and we should lay it down, as a rule not to be deviated from, to extract on the spot every extraneous body that we possibly can, either by the forceps alone, or with the aid of a bistoury. But those who best know the field of battle will easiest admit how often it is impossible to do all in this respect that they could wish.

A ball will often strike the thorax or ab-



domen, and, to an inexperienced eye, will appear to have passed directly across, or to be lodged in one of the cavities. If great difficulty of breathing, or hæmorrhage from the mouth, with sudden paleness and laborious pulse, in the one case; or deadly faintness, coldness of the extremities, and the discharge of stercoraceous matter from the wound, in the second—are not present; we shall find that perhaps the ball has coursed along under the integuments, and is marked in its progress either by what Mr. Hunter compares to a blush, or by a wheal, or dusky line, terminated by a tumour; on opening which, it will be easily extracted. In some of these long and circuitous routes of balls, where we have not this mark, a certain emphysematous crackling discovers its course and leads to its detection. The ball is, in many instances, found very close to its point of entrance, having nearly completed the circuit of the body. In a case which occurred to a friend of mine in the Mediterranean, the ball, which struck about the *Pomum Adami*, was found lying in the very orifice of its entrance, having gone completely round the neck, and being prevented from passing out by the elasticity and toughness of the skin, which confined it to this circular course. This circuitous route is a very frequent occurrence, particularly when balls strike the ribs, or abdominal muscles; for they are turned from the direct line by a very slight resistance indeed,

although they will run along a continued surface, as the length of a bone, along a muscle or a fascia, to a very extraordinary distance at times. If there is nothing to check its course, and if its momentum is very great, it is surprising what a variety of parts may be injured by a musket ball. I have seen cases where it has traversed almost the whole extent of the body and extremities. In one instance, which occurred in a soldier, with his arm extended, in the act of endeavouring to climb up a scaling ladder, a ball, which entered about the centre of the humerus, passed along it, over the posterior part of the thorax, coursed along the abdominal muscles, dipped deep through the glutæi, and presented on the fore-part of the opposite thigh, about midway down. In another, a ball, which struck the breast, lodged in the scrotum, the man standing erect in the ranks.

A very slight obstacle will serve to turn balls from their course; and many "hair-breadth 'scapes" are narrated among military men, where a button, a watch, a book, or a handkerchief, has been the means of preserving life. It was at one time rather a prevalent idea that silk had the power of rendering its wearer, to a certain extent, impenetrable to a musket ball; and, as a very natural consequence of this opinion, waistcoats of that material were recommended to be worn. I know of no cases where silk has



been more useful than any other substance in turning a ball. A case has come within my knowledge where an officer has been struck by a ball, which, first impinging against a silk handkerchief worn in his breast, not for safety, but convenience, was so far from being turned by it, that several duplicatures of it were actually carried into the pectoral muscle by the ball. It served, however, one useful purpose; for, on withdrawing it from the wound, the ball was brought along with it, bedded in its folds. Where a ball has entered any of the cavities, its course is often rendered very obscure. The discharge, if any, of the peculiar fluids, as air, urine, fæces, &c. will very clearly detect it, if the organs containing them are wounded: but I have observed and demonstrated several cases in which the ball has fairly penetrated the parietes of the thorax; but more frequently the abdomen; and yet the organs contained under the point of its entrance, or even at that of its exit, have not been injured. I was first led to an examination of the passage of balls, not only along a convex surface, but also along a concave, from seeing the course of some musket balls which had deeply grazed along, but not penetrated, the arm, when it was in a curved position, as in a soldier when firing his musket. In this posture of the soldier, I have frequently seen the mark of the ball commencing at the wrist,

and, instead of going through, or perhaps flying off at a tangent, and striking the breast, go all round between the shirt and skin, furrowing the latter, and going out at the point of the shoulder, thus describing a portion of the circumference of a circle. In mounted officers also I have seen this propensity to go on a concave surface, where the ball has struck the outside of the calf, and, from the bent position of the knee, has been thrown up into, or above, the popliteal space, rendering all search after it useless for a long time. Indeed, one eminent London surgeon, who was consulted in a case of a general officer whom I attended, and who had been wounded in this very way, could not believe that the ball had lodged at all: it was discovered, however, by a Parisian professor, where I asserted it would be found; for its entrance had been clearly demonstrated by an abscess, which formed in its course, and discharged, on being opened, several pieces of stocking and pantaloons, with several clots of blood; but the most accurate and patient investigation could not detect it for several months.

In six fatal cases which I very minutely examined, this occasional course on a concave surface was very visible. In two, the ball passed between the lungs and pleura costalis, entering on the right of the sternum, coursing round, and passing at nearly an equal distance through

the opposite side, near the spine. In one, the ball entered over, and was supposed to have passed through the spleen. On dissection, it was found to have passed along the posterior part of the spleen, and lodged beside the spine, leaving a furrow all round from its entrance to its lodgment. In one, the ball entered exactly over the spleen, and passed round to the middle of the tenth rib of the right side, furrowing the diaphragm. In two, the balls entered close to the umbilicus, and passed out exactly opposite, beside the spine. The men were supposed to have been shot through the bowels; but it was found that the balls had passed round the abdominal parietes, run between them and the viscera contained, without opening them, and passed out. In all these cases inflammation was present to a very high degree; and, in one, gangrene was so far advanced as to render dissection extremely offensive. A further proof of the propensity of balls to take a curved direction, is often seen in cases where they strike the front of the hat, and, running round, carry off the hinder tassel\*.

If the ball has passed fairly through the parietes of the thorax, or abdomen, we dress both orifices, as in the first case, and take away from sixteen to twenty-four ounces of blood from the arm, if no hæmorrhage has followed. We should be equally attentive to

\* Vide Le Vacher, in *Memoires de l'Academie de Chirurgie*, tome iv. for some valuable observations on this subject.

the abstraction of blood in cases where a round shot, or piece of shell, has grazed the head, neck, thorax, abdomen, or any of the joints ; or where they have been contused by the splinters of a shell, or flying stones, or clods of earth. In all these cases we shall also derive much future benefit from unloading the bowels by a calomel pill, with some antimonial powder ; a medicine, both from its purgative power and its portability, which should always be ready in the field panniers. In cases where the skin is only slightly torn or ruffled, we dust a little scraped lint or charpie on the track, and lay a pledget of emollient ointment over it. It is astonishing how differently a wounded man feels and speaks of the surgeon who performs these simple little offices for him in a neat and dexterous manner, and of him who roughly, confusedly, and without any apparent interest, hurries over his dressings with a slovenliness, ill-concealed by prodigality of plaster, lint, and bandages.

I shall now make some observations on the field treatment of the more complicated cases arising from gun-shot ; and which either require operation on the field or shortly after removal to the fixed hospitals.

1st. It frequently happens that an arm or leg, or perhaps both, are carried completely off by round shot, leaving an irregular surface of jagged and lacerated soft parts, and a projecting bone shivered to pieces. The obvious plan



to be followed in this case, is to reduce this horrid-looking wound to the simple state of a limb which has been separated by art.

We carefully examine the extent of the injury done, particularly to the bone, and amputate on the sound part, as much beyond the injury as we conveniently can. If, however, the bone is splintered to the very joint, or so close as to excite our fears as to future consequences, we operate beyond it, on the upper part of the limb. If the head of the humerus itself is injured, or the shaft splintered, with much destruction of the soft parts ; or if the head of the bone alone is left in the glenoid cavity, the rest being carried off, we forthwith take it out of the socket ; an operation as simple, if properly planned, as any in surgery ; and one which, on all occasions where the bone is injured high up, is infinitely preferable to amputation lower down. It not unfrequently occurs that the arm is carried clean out of the socket ; and in this case very little more remains for the surgeon to do, than to pass a ligature round the arteries, *even though they do not bleed, as often happens*—to cut short the lash of nerves, which, in this case, usually hangs far out of the wound—to bring the lips towards each other by adhesive straps, and to support them by proper compress and bandage.

The operation of excision of the head of the humerus, as recommended and practised by

Boucher, Thomas, Moreau, and other French surgeons, and by White and Park, in England, is a proposal well known to all military surgeons. It is not, however, one generally adopted; I have never seen it performed on the field; and in hospital practice I have only seen one case of it. The frequency of its removal by M. Larrey and Mr. Guthrie should encourage us to hold the plan in view\*; but I have not enlarged upon it as a *field* operation; its seriousness, the comparative rarity of the cases requiring it, and its doubtful utility, rendering it a subject for consultation in the hospital, and one not to be lightly treated of from theory alone, or from a few successful cases. If the bone is much splintered, and particularly if its periosteum, for any extent towards the condyle, is injured, we have no means to guide us to the probable boundaries of inflammation or death of the bone; and a perfect amputation may become necessary, from those events, after the head of the bone has been removed. If the ball has only struck, fractured, or otherwise injured the head of the bone, without extensive laceration of the capsular ligament, injury to the great vessels or nerves, &c. &c. the surgeon would be utterly unjustifiable, either in the amputation of the limb on the field by a

\* Vide Park on Carious Joints; Guthrie on Gun-shot Wounds of the Extremities, p. 113, London, 1815. Larrey's Memoires.



joint operation, or in the excision of any part of it. Simple and safe as the operation of amputation is, at the articulation of the upper extremities with the trunk, it becomes one of the most serious in military surgery, when the lower is engaged. There is not one patient in a thousand that would not prefer instant death to the attempt. Obligated as we are coolly to form our calculations in human blood, there is still something in the idea of removing the Quarter of a man at which the boldest mind naturally recoils ; and yet there are cases in which we have it only left to balance between certain death and this tremendous alternative ! The propriety and even the necessity of this operation has been so ably and fully treated of by Mr. Guthrie, and is so well supported by two living instances (one performed by himself at Brussels since the publication of his work, in which I had the pleasure of being one of his assistants), that I should not do justice to the subject, did I not refer to his truly practical book on this point.

2dly. Extensive injuries of the joints form an urgent class of cases for immediate amputation. I am well aware that some very favourable joint cases have ended successfully without removing the limb ; but I will venture to assert, that the pain and inconvenience of the cure, the inability of the member, and its proneness to disease, have

infinitely counterbalanced the benefit derived from saving it.

An instance has come to my knowledge, in which an eminent army surgeon recommended amputation for a case of this description. Unfortunately for the patient, he listened to the hopes held out to him of saving the limb by other practitioners. After a tedious confinement and much misery, the limb remained *appended* to his body; but, at the end of *thirty years*, he solicited his original adviser to remove the part, which was accordingly done to his great relief.

In civil society, where the patient has always led a temperate, quiet life, and the injury has been inflicted perhaps by a clean cutting instrument, or a small ball has passed near or partially injured the joint (a case so very different from that occasioned by a large shot passing into or near a joint, where the patient has to be dragged over heavy roads, in bad carriages, without surgical aid or medical comforts), I know that cures have been effected; and even in military life there are instances to be found of the same kind. I would still, however, lay it down as a law of military surgery, that no lacerated joint, particularly the knee, ankle, or elbow, should ever leave the field unamputated, where the patient is not obviously sinking, and consequently where certain death would follow the operation.

3dly. Under the same law are included, by the best and most experienced army surgeons, all compound fractures close to the joints, especially if conjoined with lacerated vessels or nerves, or much comminution of the bone, particularly if the femur is the injured bone.

4thly. Extensive loss of substance, or disorganization of the soft parts, by round-shot, leaving no hope of the circulation being carried on, in consequence of torn arteries or nerves.

5thly. Cases where the bones have been fractured or dislocated, without rupture of the skin or great loss of parts, but with great injury or disorganization of the ligaments, &c., and injuries of the vessels, followed by extensive internal effusions of blood among the soft parts.

Life has certainly been prolonged and even preserved under all these unfavourable circumstances; but the chances are extremely precarious, and few would chuse to retain existence on such terms.

It is very rarely indeed that a patient does not conform himself implicitly to the opinion of the surgeon in cases of this kind. I have generally found all classes pressing for the removal of their limbs. Some instances, however, will occur to the contrary; and the following is one where we are at a loss which to wonder at most—the strength of the mind that could act with such coolness, the weakness which could dread an oper-

ation under such aggravated tortures, or the soundness of constitution that could support them for such a length of time.

#### CASE.

AN officer of the corps of Brunswick Oels was wounded at the action of Quatre Bras, on the 16th of June 1815, by a round-shot, which completely destroyed the articulation of the knee-joint, by carrying off the head of the tibia and fibula for the extent of fully six inches. The upper part of this horrid wound was bounded by the condyles of the femur, with the patella, hanging by the tendon of the rectus; the lower by the shattered remnants of fractured bones; the posterior part, which had alone retained the limb, was formed by the lacerated muscles of the calf. Little or no hemorrhage followed the wound; and the unfortunate sufferer would hear of no operation, nor would he submit to any surgical treatment, nor indeed accept of any assistance from the attending surgeon, except an occasional paper of bark, or some charpie. On the 17th of July following, I saw him in company with some professional friends: he was then sitting up in bed, calmly smoking his pipe, and, with the most profound indifference, dusting the spongy masses of flesh thrown out at all points of the wound, with bark, and covering them with charpie. The circumference of the wound we estimated at about twenty-

four inches ; and it is worthy of remark, that the unfortunate patient had never experienced any of the symptoms of collapse, which might so naturally have been looked for ; he survived eight days after I saw him, and then died hectic.

The question of immediate amputation has of late attracted an attention which its great importance naturally calls forth ; but it appears to me that an idea has been impressed upon the minds of practitioners in civil life, that doubts as to the propriety of the practice had existed among the British army surgeons. For my own part, I have never known any differences of opinion on the point ; in books, it is true, it has been most amply discussed before the present generation were in existence, but in British practice, all doubts have long been at an end. \*

It is but justice to British surgeons, both naval and military, to declare that immediate amputation is neither a new doctrine or a recent practice among them. How long it may have been in use in the former service I cannot undertake to say, but every naval surgeon I have conversed with informs me, that he always employed the knife where its use was indispensable, *at once*,—which implies a

\* For a most interesting historical summary of the arguments, see Professor Thomson's Report of Observations made in Belgium, &c. p. 159 ; which, in a short space, contains every thing worth knowing on the subject.



much earlier opportunity than army surgeons can possibly enjoy. To advert to the experience of our service in the late wars ; I have the authority of my friend, Dr Pitcairn, who served as surgeon on the Staff of the Egyptian expedition, to state, that whenever the surgeons could operate upon the field in that country they did so, and for himself he only lamented that he could not remove more limbs in that situation, having never had any doubts upon the point, and being still more confirmed in the justice of his opinion, by the results of the deferred operations. On the first landing of our troops in Portugal, the propriety of the practice was impressed upon the surgeons, as I have been informed, by Mr Gunning, then senior surgeon upon the Staff, and subsequently Surgeon-in-Chief of the Peninsular army ; the practice was constantly followed, and the precept orally delivered from surgeon to surgeon during the whole period that I served in that country, and the able work of Mr Guthrie forcibly elucidates its propriety ; while the utility of the same practice, as adopted by the French, is fully shown by Mr Larrey. Finally, the results of the field amputations, after the battle of Waterloo, confirm the published experience of both these writers, and it is to be hoped that the question is now set at rest for ever. Men will certainly be found at all times, who, not having their own opinions formed from

experience, will communicate their doubts and hesitations to those around them : but surely their crude and vacillating speculations are not to be assumed as the measure of information that has been obtained by others. Have those who suppose that the question of early amputation is still unsettled, consulted the opinions of the better-informed army surgeons of the present day, or the writers of the past ? If they have, it must be a strange misinterpretation, or a wilful misunderstanding of both, still to persevere in supposing that it wants further consideration. The fact is established as firmly as any other in surgery ; and perhaps in the whole range of the science there is not one point where opinions have so little varied, among English practitioners, from Wiseman downwards. That author expressly says, that the practice was to amputate on the instant, when the patient was free from fever. From him, who was writing a treatise on the duties of the army and navy surgeons, not from guess, but from actual experience, it was to be expected that he would have touched upon the subject : he has done so ; and he has dismissed it in one line as a settled point. A later author, who had also the benefit of great experience in the service, and who was writing a treatise on physic, mentions this surgical practice incidentally, and as a well-known fact, tending to illustrate the opinions contained in

his book ; a circumstance, by-the-bye, which adds much more weight to the value of the opinion, than if it was pressed into the service, and marshalled among a line of quotations on the side of a question in literary warfare “ It “ was very obvious to me,” says White\*, in his book *De Recta Sanguinis Missione*, “ from “ chirurgical practice, that where amputations “ are requisite, they succeed ten to one better if “ the operation is performed immediately after “ the misfortune, than four or five days after. “ *This all our surgeons in the army very well “ know, as well as in the navy.*” Mr. Hunter is the leading English writer who has thrown any doubts upon the question ; but he considered it theoretically ; and Mr. O’Halloran, who has taken the same side, had hardly any practice in those cases.

The truth is, that the point was principally agitated among the French surgeons, and not among us. At this very hour they hesitate about procuring the immediate adhesion of cut

\* *De Recta Sanguinis Missione*, or new and exact Observations of Fevers, in which letting of blood is showed to be the true and solid basis of their cure, as well as of almost all other acute diseases, &c. By J. White, M.D. London, 1712. 8vo. This author was a naval surgeon, and practised in 1703 and 1704, upon the coasts of Spain and Portugal. He afterwards settled at Lisbon, where he successfully applied his practice of venesection to the fevers and dysenteries of that country.

surfaces. But we would surely look upon it as somewhat libellous upon English practitioners, if an author should take up his pen to write persuasives to them, to place clean cuts in close apposition ; or, judging from the general practice of the Parisian hospitals, assume that the point was unsettled in those of London.

The propriety of amputation on the field being admitted, the question naturally suggests itself, what is the proper period ? instantly on the receipt of the wound, or consecutively ? The practical reply is : *With as little delay as possible.* While hundreds are waiting for the decision of the surgeon, he will never be at a loss to select individuals who can safely and advantageously bear to be operated on, as quickly as himself and his assistants can offer their aid : but he will betray a miserable want of science indeed, if, in this crowd of sufferers, he indiscriminately amputates the weak, the terrified, the sinking, and the determined. While he is giving his aid to a few of the latter class, encouragement and a cordial will soon make a change in the state of the weakly or the terrified ; and a longer period and more active measures will render even the sinking, proper objects for operation. If, however, he is disappointed in his hopes, surely the dictates of common sense will point out the necessity of procrastination, and will restrain the surgeon from performing what he knows must *ultimately* be done, at a



period where it is manifestly counteracting the object he has in view, to do it *at once*. Would he in the cold stage of ague administer the remedies that he would in the sweating, or in the intervals of the paroxysm?

When, therefore, he finds a patient with a feebleness and concentration of the pulse, fainting, mortal agony, loss of reason, convulsions, hiccup, vomiting, irregular chills, with stiffening of the whole body, universal feeling of cold and numbness, with sense of weight, change of colour, and other symptoms of collapse, so well described by Le Conte : \* he waits patiently for a return towards life ; he administers wine, warmth, volatiles ; he soothes and he encourages ; and when due re-action is established, he performs that humane operation, the utility and necessity of which are now confirmed, beyond the possibility of doubt, or the influence of cavil. †

It is a very prevalent idea among the uninformed private soldiers, and some of the junior officers, that the surgeons “ lop off,” as their phrase is, limbs by cart-loads, to save trouble ; and sorry am I to say, that some private practitioners, whether from ignorance or design, have assisted in propagating the scandal. His own conscience

\* Memoire par Le Conte, Prix de l'Acad. Tome VIII. 12mo edition.

† Bilguer, however, takes a very different view of this operation, “ De Amputatione,” Halle, 1761.



is frequently the sole reward of the military surgeon ; it will solace him under such unmerited reproach ; and under its influence, and with science and experience for his guides, he will sometimes see causes for hope, under circumstances of apparently desperate ill omen.

Where a compound fracture happens from a musket ball, at a distance from a joint, without great destruction of the soft parts, or splintering of the bone, or separation of its periosteum to any great extent, and where we conceive it possible to effect the salvation of the limb, we must pick away all the splinters of bone or shell, bits of cloth, dirt, &c. that we conveniently can. If there are sharp pieces of bone sticking out, we saw them off, and then apply the many-headed bandage and proper splints, cushioned off by tow or rags. We bleed the patient in proportion to the violence of the injury, administer a purge, and lay him on the litter, or in the waggon that is to carry him to his ultimate destination, with the limb in the most relaxed and easy position. If the fracture is of the humerus or fore-arm, we may be more particular in making our extension and coaptation, and apply our bandages and splints with the view to their remaining more permanently fixed than we can in fractures of the lower extremity, particularly the thigh ; for, in the latter case, it is utterly impossible to set the limb as it ought to be upon

the field ; and we are yet, I fear, in want of machinery to keep it steady during the journey to the rear. We are guided by the same principles in cases where balls have passed through, or but partially injured, the hand or foot.

In open sabre cuts, thrusts from pikes, bayonets, or small swords, we may commence our plan of cure upon the field. After cleaning away the blood and filth, and removing any extraneous matter within our reach, we lay the lips of the wound neatly together with straps, or, if necessary and practicable, with ligatures, and support the part with a bandage ; or, if it is a deep thrust, we lay a compress along its course, and bind it up moderately tight. If the joints or cavities are injured, we employ the lancet unreservedly, and administer a brisk purgative : if the intestines are cut, and hang from the wound, we secure them by a few close stitches to the lips : if they are sound, we replace them, and close the orifice with ligatures and straps.

In all contusions, sprains, lacerations, or burns, from the explosion of detached cartridges or ammunition waggons, little more can or ought to be done, than cleaning the parts and applying compresses dipped in ol. terebinth. or liniment saponis, or acetic acid and water, as may be convenient ; and, if there is a great loss of substance, pledgets spread with some mild ointment.

In every case where we can get at any large artery that may be injured, we should invariably tie it, although at the time it may not bleed. From a neglect of this rule, many lives have been lost ; and, on the same principle, we should be liberal in our distribution of tourniquets among the wounded proceeding to the rear, although pointed in our caution as to their employment. .

In giving this sketch of a few of the leading duties of a military surgeon in the field, I have gone upon the supposition that there is every convenience for conveying off our wounded, and that the field of battle has been our own. Should a reverse, however, take place, it then becomes the duty of a certain proportion of the hospital staff to devote themselves for their wounded, and become prisoners of war along with them ; and it may be an encouragement to the inexperienced, while it is grateful to me to observe, that I have never witnessed an act of unnecessary severity practised either by the French or English armies on their wounded prisoners ; while, on the contrary, the contending nations have, in numerous instances, vied with each other in acts of tenderness and humanity to those whom the chance of war had thrown into their hands. It is also a soothing reflection, that, where the wounded are very numerous, and particularly with compound fractures, there will be

a vast saving of human life by leaving them in the power of the enemy, and not dragging them with a retreating army.

Should we retain possession of the field, but without the necessary conveyance to carry off all our wounded, parties with refreshments, bread, wine, beer, soup, &c. and, above all, canteens of water, should be sent frequently over the field; and, when possible, huts, or shelter by boughs, hides, or blankets thrown up, until all are removed to the first station or receiving hospital.

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#### RECEIVING HOSPITAL.

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THERE is no part of our arrangements on which more of the success of our future practice, either as it refers to the ease and comfort of the wounded themselves, or to the facilities of performing the duties thereby acquired by all ranks of their attendants, than on the due establishment and regulations of the receiving hospital.

This ought to be either a large building, near the entrance of the city or town where the fixed hospitals are situated, or, if that convenience cannot be found, a house, yard, or barn; or even

a few tents near each hospital, or a temporary bivouac, may always be employed for this purpose. Here all the wounded should be brought ; the Purveying Officer should attend to supply soup, wine, bread, and such other refreshments as the Medical Officers may think proper, and to register the names, regiments, and companies of the patients, receive their arms, accoutrements, and necessities ; to furnish them with hospital dresses or shirts, or, if these are not to be had, at least to take from them their bloody and filthy cloathing, and oversee the proper ablution of their persons. Some steady medical officers should also be placed here, and relieve each other at stated intervals, in dressing and classifying the patients according to the site and nature of their wounds, which, on their arrival at their final destination, is to form the basis of their arrangement in divisions and wards

With each convoy of wounded thus sent off, a comprehensive return should be transmitted to the resident medical officer at the fixed hospital.

When time will at all permit, fatigue parties should be incessantly employed in preparing the fixed hospitals for the reception of the wounded ; or, if they cannot be procured, hired labourers, or natives pressed into the service, and paid afterwards by the commissariat at a rate fixed by the local authorities. By these people, under the superintendence of proper overseers, and



under the immediate orders of the purveying officers, every species of filth and nuisance ought to be most carefully removed from the rooms, staircases, galleries, and passages of the various buildings ; which should be, if possible, white-washed ; the kitchens repaired, or new ones erected ; the necessaries cleaned, and proper drains cut from them, or fresh pits sunk ; the tanks, wells, pumps, or pipes, placed in proper repair, and under strict controul ; places of security set aside for the arms, &c. of the men, and for the stores of the purveyor and apothecary ; and all that variety of preparation made which experience may suggest, and which the spur of the moment, or the nature of the service and of the accomodation, may demand.

There is, perhaps, no body of men more thoughtless, when left to themselves, than soldiers : they have been so long accustomed to have all their wants supplied or anticipated, and have, in fact, been so completely transformed into machines, actuated and directed by their superiors, that, if uncontrouled, they are either helpless or degenerate. It is then that one of their characteristics, while under the eye of their officers, is completely laid aside. In their absence, and in the indulgence which they suppose a residence in a hospital implies, they forget, or wilfully neglect, the most obvious means of cleanliness and regularity, and sink into filth, sloth, and debauchery.

Those men, the greatest part of whose lives has been passed in the open air while with their corps, no sooner get within the precincts of an hospital, and beyond the immediate cognizance of their officers, than they shut up every aperture of their wards, whether accidental or constructed for the purpose of ventilation ; and so long as the means of closing a window, door, fire place, or ventilator, is left them, more particularly German and other Foreign soldiers, so assuredly do they close them up. A very excellent mode of ventilation was adopted by the French in the Peninsular war, copied from their permanent military hospitals at home ; viz. perforating the walls of each ward with two rows of conical tubes, the larger diameters towards the inside of the ward ; one row on a level with the floor, the other with the ceiling, at the distance of from ten to fifteen feet from each other, and so distributed, that the tubes of the upper or ceiling row corresponded with the unbored space of the lower range. By these means, or by leaving vacancies in the glass of the windows, so shaded over as to prevent the entrance of rain, as in many of our manufactories at home, we may, with great attention and strict watchfulness, ensure a certain freedom of circulation of air in the wards : but, without taking the doors and windows off their hinges, or removing the panes from the latter, in crowded

rooms, or hot weather, we can never promise to ourselves a complete and sufficient freedom in this respect.

Great additional ventilation, and increased facilities for detecting and removing filth, will also be gained by fixing the beds at least one foot from the walls of the ward, so as to admit a complete passage round them ; and the higher the bedstead, or boards and tressels, are from the ground, so much the greater advantage do we gain in those essential points.

We are often, however, so circumstanced, that we are obliged to lay our patient on the ground, either on paillasse cases, or sheets sewed together to serve as such, filled with straw or other materials ; and the urgency of circumstances sometimes compels us to lay them on loose straw, or even the bare floor. In all these circumstances the most rigorous attention should be paid to ventilation and cleanliness : the patients should be allowed as much room between each other as possible ; the loose straw should be formed into mats, or made up into light trusses, and not allowed to be laid down in corners, or close to the walls or partitions ; and the site of the bed should be shifted as frequently as possible, and the straw of it removed and burned.

Every effort on the part of the medical officers should be used to procure boards and tressels,

or other temporary means of removing the beds from the surface of the floor ; for, independently of the comfort and cleanliness, and the obviating of damp, it is a fact, now well known in military hospitals, that the lower portion of the atmosphere of the occupied wards is invariably the least proper for respiration, and that in which sores heal most slowly.

To establish this proposition in an unanswerable manner, M. Brugmans resorted to chemical agents. The results were, that even in the best regulated and constructed hospitals, and in which no case of hospital gangrene exists, the layer of air nearest the floor contains a larger proportion of carbonic acid gas than that of the higher parts of the same ward.

At the height of two feet, sometimes even two feet and a half, the proportion of carbonic acid gas is commonly  $\frac{8}{100}$  to  $\frac{12}{100}$ , and close to the floor,  $\frac{20}{100}$  ; and even a larger proportion has been observed.

The flame of a candle, made to approach the floor, visibly fades ; and lime water, in an open vessel, rapidly becomes opaque. \*

\* Vide " Annales de Litterature, &c." par MM. Kluyskens & Kesteloot, Vol. XIX. or Nos. 106 and 107, where a paper of considerable interest is given by Professor Brugmans of Leyden, which contains a very valuable addition to our knowledge of the state of the atmosphere in military hospitals, whether under ordinary circumstances, or the dreadful infliction of contagious gangrene. I have observed, on various occasions,

A great aid to the cleanliness of an hospital, is the selection of a proper apartment or gallery, in the vicinity of the kitchen, for the purpose of messing; or tents may be employed for the same purpose: indeed, a supply of those articles is of the most serious import in an hospital, as all cases of fever or infectious disease, or those peculiarly requiring seclusion, may be promptly and effectually removed into them from the wards.

Whatever may be the extent of our accommodation, it ought to be formed into three grand divisions, which may be larger or smaller as circumstances demand; viz. the surgical, the medical, and the convalescent branches; the two latter, of course, will not be so urgently wanted, immediately after an action or series of field movements, as the first; but they should be held in view, as ultimately of great consequence towards the safe conduct of the medical part of the campaign.

I would recommend it also, as a general rule, never to open several hospitals for the reception of the wounded at the same time, although we should always have them ready prepared for

a general improvement of the wounds and ulcers take place in the military hospitals after a supply of boards and tressels, or other means of elevating the beds from the floors; the same has been observed on board the Hospital Ship, on the coast of Egypt, by my friend Dr Dickson of Clifton, in patients elevated above the decks.



such an event ; but always to permit one to be tenanted, and its officers appointed to their several duties, before we commence upon another. The attention of the medical and purveying officers is thus directed to one object only at a time ; and when an hospital is once put upon the proper establishment, without being confused by additional admissions, the business will go on with the utmost regularity. On the same principle, wards, sub-divisions, and divisions, ought all to be completed before others are opened. The size of the ward will entirely depend upon the nature of the building employed as an hospital : 100 beds, however, are amply sufficient to form a sub-division, and as many as one assistant in ordinary cases can possibly manage, even if of the slightest nature. To this there should be one ward-master and six orderly men at least. The employment of females is one of the greatest sources of irregularity in an hospital ; every species of excess, idleness, and plunder, is carried on under their auspices.

In accommodating the wounded officers, if an hospital can be procured for them, which is a matter of high importance\*, the same systematic arrangement may be easily adopted ; but, at

\* For some practical remarks on this subject, vide a pamphlet, by Dr. Faulkener, on the Expediency of an Hospital for Officers.

all events, certain streets or sections of a town or city ought to be solely appropriated for their reception. Without some arrangement of this kind, inconceivable difficulties will arise in administering to them the necessary professional assistance, which I have painfully experienced on more than one occasion. Much is to be conceded to the peevishness of sickness, and much to the habits of command which officers have been bred up in ; but, with every allowance for their sufferings and their rank, the attending professional man, especially if of a junior class, will have much to bear ; and, with great respect for the valour and honour of British officers, I am forced in justice and candour to say, that in some instances I have observed that the most slightly injured and the lowest in rank have been often the most troublesome and unreasonable ; and I have heard the medical officers reprobated in the most insulting terms for non-attendance at specific hours upon the very individuals whom I have known to be the most constant frequenters of the gaming table and the brothel. A false delicacy in those cases is sure to be followed by calumny and complaint ; and the medical attendants should at once inform the senior medical officer, and respectfully submit his reasons for declining further attendance without proper investigation.

The fixed hospital being ready prepared, the

compound fractures should all be first removed, and placed in airy wards, either on the first floor, or in those apartments easiest of access. They should be classed according as the upper or lower extremities, or their joints, may have suffered, and as the upper or lower portion of each individual limb may be implicated ; so as that all cases of a similar nature may be near each other, and, as much as possible, the men of the same corps brought together.

The same classification and general arrangement should be pursued in the wounds and injuries of the head, neck, breast, abdomen, pelvis, and extremities. The labour of the medical officers, whether purely professional, or as referring to the construction of the necessary returns, are thus astonishingly abridged, and the due attendance upon the wounded accelerated and assisted.

We shall now suppose our hospitals filled, our patients laid comfortably in their beds, their diets regulated, and the whole machine in motion. The diet table, as now in use in the British hospitals, is admirably calculated to ensure a sufficient supply of nourishment to the soldier ; and the privilege of allowing some extra articles to those on the lowest rates, *if not abused*, must effectually meet every dietetic want. There is no point in which a young practitioner is so apt to be deceived, or in which his humanity may so

often lead him astray, as in this. The fewer extra articles, therefore, that he orders, he may rest assured, the better for his patients ; to prevent all mistakes, the diet should be regularly marked by his own hand at the bed-side : and if wine or spirits are allowed, they should be invariably given under his own eye, or mixed with his patient's medicine\*.

It is obvious that whatever arrangements facilitate the execution of the duties, must ultimately benefit the wounded ; and a conscientious officer will employ the time saved to him in this way in redoubled exertions for the benefit of those committed to his care, and endeavour to identify his own comfort and convenience with those of his patient. Punctuality of attendance, preparing dressings and medicines in the intervals of the visits, and a regular registration of cases, will enable any man of common industry to acquit himself with credit in his situation ; while men with the purest and most scientific views, without those mechanical helps, exhaust their strength and redouble their toil.

\* Vide Appendix.

## DRESSINGS AND GENERAL MEDICAL TREATMENT.

THERE is no urgent necessity for removing the dressings which have been applied in the field to the more simple wounds of the extremities for the first two or three days, whether the wounded are arrived in the hospital, or only on their passage to it ; provided the slips of plaister and bandage are sufficiently secure, the dressings unstained by a sordid bloody oozing, or no serious stiffness or uneasiness is perceived in the part by the patient himself. \* In this, however, we must be guided by season, climate, and the constitution of the individual, or the peculiarity of his wound. It will generally be sufficient to keep the dressings moistened with cold water, either alone or mixed with a little spirits, vinegar, or wine ; or, if the weather demands, and convenience on the march permits, the same moderately warmed. As soon as possible after this period, the field dressings should be removed, and the limb either covered with cloths moistened in an appropriate liquid, or laid in emollient poultices moderately warm. It has of late years become a fashion to decry the application of poultices, and to dwell on the harm they *may* produce, putting entirely out of view the essen-



tial service that we actually derive from them : but, after long experience on this point, and judging from the feelings of the patients themselves, and the obvious effects upon their wounds, I have no hesitation in saying, that a soft and moderately warm poultice of bread, meal, bran, pumpkin, carrot, or any other emollient substance, carefully applied, and removed at least twice a day, until the sloughs begin to loosen at the edges, and a purulent oozing is seen issuing from under them—in fine, till the process of supuration is fairly commenced, is the best and most appropriate remedy in the early stages of simple gun-shot wounds, attended with much contusion of the soft parts, and high inflammation. They should not be continued after this period, nor should they at any time be applied, except under the direction of the attending surgeon. It is to the abuse of continuing them day after day indiscriminately to all states and stages of wounds, that their rejection by many is to be attributed, and that their bad effects are due. If the inflammatory symptoms do not run very high, and that the sloughs are beginning to separate kindly, a pledget, spread with any simple ointment, or merely dipped in oil, and covered with some cloths moistened in acidulated water, will be quite sufficient as an external application ; while the general state of the system is cautiously attended to in all cases. Few subjects bear

more free or full purging than soldiers ; and, under certain limitations, they are equally tolerant of the lancet.

Great prejudice exists among some of the younger surgeons on the subject of phlebotomy, as applied to soldiers. They have some idea that that class of men cannot bear evacuations, particularly by the lancet, so well as the lower orders in civil life : but the very reverse is the fact ; their whole plan of diet, exercise, &c. or, as it is termed, the non-naturals, tends to carry their system to the highest possible pitch of vigour (I of course am speaking of the effective bayonets) ; and the daily practice of our hospitals proves, that the recruit just taken from the plough, with all the appearance of health which a ruddy countenance and a corpulent person can convey, will not bear the lancet nearly so well as the same individual in a few months after having been accustomed to the fare and mode of living of a soldier. I have almost daily instances, in the hospitals under my inspection, illustrative of this fact, where blood has been drawn, for severe inflammations of the lungs and other viscera, to an extent, one third of which would probably have sunk the patients beyond recovery a few months before, when employed as day-labourers or mechanics.

Few, if any, of the veterans are without either confirmed hepatic affections, or a strong

tendency that way ; and it has never fallen to my lot to see any class regular in their mode of diet, without the strictest enforcement of rigid discipline. Hence frequent derangements of the chylopoietic organs, and vast determination to the head and breast, where the least access is allowed to spirituous or vinous potations, or where the frequent long fasts and the irregular system of cookery, unavoidable in severe marches and grand movements, are succeeded by the plenty of victory, or the mistaken kindness of their comrades in the hospitals or on the journey to them, which gorges the wounded with food and intoxicating liquors ; a practice that for the first few days no precautions can altogether prevent. It should never be forgotten that the state of the stomach and bowels has a remarkable influence upon the discharge from a wound, and is in turn influenced by it ; a degeneration of the discharge and a deranged state of the intestines being almost always inseparably connected ; and very frequently the approach of a change for the worse in the wound may be prognosticated some time before its actual accession, by the torpor or relaxation of the intestinal canal, and the depraved quality of its contents\*.

\* Among modern authors on this subject, I would particularly refer to the works of Hamilton and Abernethy ; but the observation did not escape the illustrious Boerhaave, who

The state of the skin is also an object of particular consequence in the prevention or moderating of fever ; and in this view the antimonial preparations will be found of the most essential service, administered either in the aqua ammon. acet. or in an anodyne draught, if severe pain and spasmodic twitchings about the wound render opiates necessary. In ordinary cases, however, I would recommend the sparing use of opiates ; and in the more severe, particularly if attended with fractures, we should always reserve them to the latter part of the cure, when they become so indispensably necessary. Where a temporary lowering of the system is an object of importance, and the use of the lancet is to be restricted, nothing is more effectual than nauseating doses of the antimonial class. It must also be kept in view, that, independently of the symptomatic fever which more or less attends all wounds, men labouring under them and crowded together in large hospitals are particularly subject to the prevailing diseases of the country where they are, even though they may be complete *acclimatés* ; their irritable and debilitated state rendering them particularly obnoxious to every species of contagion common among the inhabitants, and to some peculiar to themselves.

published his Thesis in 1693 at Leyden, upon the utility of inspecting the evacuations of the sick.



When the parts are brought into free sup-  
 puration, great attention becomes necessary in  
 the dressings, to prevent the formation of si-  
 nuses, by the proper application of pressure by  
 compresses and bandage, by carefully removing  
 all stagnant purulent matter, and, if occasion  
 requires, facilitating its evacuation by a regu-  
 lated use of the bistoury in the enlargement of  
 particular points, or by the forming of counter  
 openings ; by the removal of all the loose sloughs  
 and extraneous bodies which we have not been  
 able to do on the field or at subsequent dressings ;  
 and, finally, by carefully continuing every means  
 which may restore the healthy action of the sys-  
 tem. It is under the strong fasciæ of the thigh  
 and arm, and among their long muscles ; and in  
 wounds about the back and loins, that we have  
 particularly to dread the formation of sinuses :  
 but if, in spite of all our endeavours, they do  
 form, we should not trust to pressure, but at  
 once have recourse to the knife, for which no  
 adequate substitute can be found, either in the  
 mechanical or chemical stimulants of the seton,  
 or injection. Here, and here principally, it is  
 that Scarifications, as they are called, are truly  
 useful ; and in those cases they merit all the  
 praise that their indiscriminate admirers have  
 bestowed upon them.

In the tumefaction also of the muscular  
 parts of the extremities, confined by strong



fasciæ, which are attended with great pain and high fever, a prudent use of the knife will be of essential service ; inasmuch as, by removing the strictured state of the parts, suppuration is prevented, or, if it has taken place, a free exit is given to the matter, and its insinuation among the interstices of the muscles is obviated.

But the trifling and superficial scratches often made at the orifices of shot-holes are entirely useless, and scarcely ever attempted by surgeons of experience. As the following case shews the inutility of the one and the great advantages of the other, I select it from many others of a similar nature in illustration of this fact.

#### CASE.

A SERGEANT of dragoons was shot through the external part of the thigh at Waterloo, and was dressed for the first week by a Belgic surgeon. The lips of each orifice, which were plugged up with charpie, had been scarified in a radiated manner to about half an inch deep, as he said ; but were nearly healed on my seeing him. Shortly after, heat, pain, and tumefaction took place in the limb, attended with considerable fever and great derangement of the head and stomach. This at last proceeded to such a degree, that the assistants requested me again

to examine him, which I did on the 14th day. I found one orifice still open, and that some superficial scarifications had been repeated, and the limb fomented; but without effect: it was extremely tense, hot, and painful to the touch; it could not be moved without great uneasiness; the lower part of the limb, from the knee down, was œdematous, while the thigh itself was swollen up to the external trochanter; interiorly it was less so, but rather puffy. I made a long and deep incision from the trochanter nearly down to the knee, completely through the fascia, and about the centre of the limb I dipped almost to the bone. So far from this occasioning pain, the man begged me to go on; and, although there was but a very slight discharge of matter from the wound, he felt easier within an hour\*. The bleeding from the part was encouraged by warm fomentations; and in five days the sergeant was able to walk about, and was soon after discharged convalescent.

The labours of the medical officer will be much abridged in the necessary duty of dressing, if, in addition to his tray, furnished with

\* The effusion occasioned by tight bandaging, or by stricture on the parts from their being bound down by the fasciæ, never is followed by a healthy suppuration, but by a burrowing and destruction of the parts. This is very strongly illustrated in cases of paronychia.

ready prepared dressings and common formula of medicines, he provides a portable camp stool, to sit at ease by his patient's bed-side while dressing; for, without this, or some such relief, if the beds are on a low platform, or on the floor, and the cases requiring long attention, as in compound fractures, he will be exhausted before half the labour of the day is finished. To these should be added a basket for the reception of all the old filthy dressings, and an oil-skin to preserve the bedding from wet, and purulent matter or blood.

Without those little aids the young surgeon will be cruelly embarrassed on his first appearance in a military hospital after an influx of wounded. A great deal of confusion and filth will also be saved, if, at the early morning visit, all the slighter cases and those not confined to bed are ordered into the open air or a tent, and there dressed.

If the patient cannot sit up in bed, the oil-skin must be placed under the limb, and the former dressings gently moistened by a sponge and warm water, and then carefully withdrawn, the refuse poultices, lint, &c. thrown into a bucket or basket for removal, and the soiled roller handed over for the purpose of being washed for subsequent use. All filth must now be attentively removed from the surface or lips of the sore: if it is a stump or a point

where a vessel has been tied, if long ligatures are left, they must be very cautiously handled ; if adhesive straps have been used, they must be taken off one by one. Gentle pressure must be made all round to bring away any concealed matter ; and if abscesses have formed, they should be opened on the spot. The fresh dressings must now be applied without any unnecessary delay, all their loose edges and redundancies removed, and a neatness and even nicety of shape observed in the straps and dossils, which, though we ourselves know not to be essential, weigh amazingly with the patients and attendants. In the application of the roller, however, nicety is *essential*, as on its due employment the removal of existing evils and the prevention of many more entirely depend. As a support to parts requiring approximation or separation ; as preventing the insinuation of matter, blood, or serum, among the interstitial spaces ; as expelling them and preventing their re-accumulation when formed ; as repressing redundant or protruding growths, or stimulating to their absorption ; and, finally, as retaining other applications in contact to the parts—too much attention can scarcely be paid to the application of the roller : and yet candour compels me to say, that foreigners of almost all countries excel us in this fundamental part of our art. Our young surgeons may study, philosophize, and reason well ; but neither books,

reflection, nor arguments, will teach the application of a bandage, without repeated practice.

The most judicious medical treatment and the ablest surgical operation will fail, if not assisted by good bandaging ; and errors in both will soon be recovered, if a proper system is adopted. I have seen innumerable instances of most promising stumps degenerating in a few days under an inefficient or careless dresser ; and I have even traced some deaths to such a cause ; while rapid amendment and the saving of a limb often result from the due use of a proper system of dressing and applying the roller.

Escharotics, so useful under certain circumstances, are frequently sadly abused ; and an insensibility, or sometimes very high morbid irritability of parts induced by them. In simple cases of redundant or luxuriant granulations, a little scraped lint, with pressure from a compress, will be found quite sufficient for their removal ; and the same will accelerate the skinning of a wound, as well as lunar caustic, or cupreous solutions : with those two last, old soldiers are well acquainted, and they should never be trusted with their use. In no one instance either, should the orderly men or the patients themselves be permitted to apply the dressings or rollers ; and at the time of dressing, all the necessary prescriptions should be administered, and all



the minor operations, as bleeding, &c. performed. I should not do justice to this part of my subject, did I not refer to the excellent observations to be found in Professor Thomson's Lectures on Inflammation, on the management of Dressings\*, and above all, did I not particularly recommend a mild and humane demeanor to the dresser. The soldier, who is so fierce in the field and so submissive in the operation room, becomes a most fretful being under the smarting of his wounds; and he frequently looks upon our best directed endeavours for his relief, as only experiments upon his fortitude. I am sorry to say, that I have but too often seen surgeons, even of high rank and long experience, yielding to a prurience for operation, take up the knife, the forceps, and the probe on every opportunity; and handle in the most inconsiderate manner even the fractured limbs of their patients.

\* Lectures on Inflammation, by John Thomson, M.D. Edinb. 1813, p. 294. Vide also a very well-meant and well-timed Letter, by Dr. Dewar, upon a particular State of Gun-shot Wounds, addressed to Staff-Surgeon Boggie, Edinb. 1815. A paper on the subject is also to be found in the Medico-Chirurgical Transactions, vol. vii. p. 482, part ii. by the same author.

## EXTRACTION OF FOREIGN BODIES.

WE have legitimate occasion enough in the course of a surgical campaign, for the use of our whole Armamentum Chirurgicum, without having recourse to superfluous scarifications and pokings; and even under the most judicious employment of instruments, we are frequently foiled in our intentions, particularly in the extraction of foreign bodies; which, by the violence and rapidity with which they have been forced into the living solids, sometimes take very unusual and deep-seated routes, not at all to be accounted for by any preconceived theories drawn from the doctrines of projectiles, or explained by diagrams founded upon mathematical rules.

A recollection, however, of the texture of the different parts through which the ball may pass, and a comparison of its firmness, its soft or its elastic nature, conjoined with that of the general doctrine of projectiles, will be no mean assistance to our judgment in forming an opinion of the probable course of a ball.

The older surgeons were sadly puzzled on the subject of the extraction of foreign bodies, and had, as usual, recourse to magic, to prayers, and to charms, when their prepared load-stones

and rude tire-bals failed. The natural anxiety which every wounded man feels to have the supposed cause of his pain removed, and the praises which he and his friends so liberally bestow on a successful operation, have, at all times, made surgeons anxious in the invention of those very ingenious and very useless articles, bullet extractors; the employment of which is completely superseded by the common forceps; or still more by that of M. Percy, used with a little ingenuity; for wherever a bulky and complicated bullet extractor can enter, the former instruments can go down with infinitely greater ease; but, unfortunately for both instruments, we must require their mechanical power in tortuous passages, or deep-curved and angular cavities, where we can least use them.

The great point is, to discover where the extraneous matter lies; and he must possess very little manual dexterity indeed who cannot remove it from the soft parts, if the removal is adviseable\*. These bodies naturally divide

\* Those who have neither leisure nor opportunity to consult the original authors, will find a very learned and satisfactory account of the means used by the older surgeons for the extraction of foreign bodies in the "*Tableau rapide des differens instruments, etc.*" inserted by M. Percy in his "*Manuel du Chirurgien d'Armée*;" and a very good summary account of their superstitious and peculiar notions concerning wounds, will be found in the "*Liber Quintus Practicæ*

themselves, first, into the inflicting body itself, or the articles attached to it ; secondly, substances forced in with the inflicting body ; thirdly, originally component parts of the limbs, or organ wounded, but which have been rendered extraneous by their total or partial death. All these may be found either in or near the wounds themselves, or by their gravitation, by muscular action, or by other causes, may have been carried from their original situation, and deposited in or near other distant organs.

Balls of every kind, from the smallest carbine bore to that of a field piece, surrounded with cartridge paper, or flannel, and pieces of shell from the most minute size up to the weight of several ounces, are daily instances of the first class. To these may be added, though of less frequent occurrence, bayonet and sword points, lance heads, &c. To the second class are referable, pieces of clothing, buttons, coins, parts of breast plates, of watches, their chains and seals, keys, and all the different contents of a

“ *Medicinæ, Pars Quarta,*” of Daniel Sennertus, under the heads of “ *De Rebus alienis è vulnere eximendis ;*” “ *De Cæsaris Magati et Ludovici Septalii curandi vulnera methodo judicium ;*” “ *De sclopetorum vulneribus ;*” “ *De unguento armario ;*” and above all, in his twenty-fourth chapter, part iv, where the following question is fully debated : “ *An licet Christiano periaptis et sigillis appensis, vel similibus modis, se ab armis inviolabilem præstare ?*” See also Paré’s Works, lib. ii.

man's own pocket, or of the pocket or person of a near comrade ; splinters of wood, stones, earth, &c. In the last class, which are by far the most troublesome and dangerous, are included splinters of bone of all sizes, coagula, and sloughs. It may be asked, how can such large masses possibly be contained in a limb, or lie among muscles without being betrayed by their bulk ? The explanation is not difficult ; the immense rapidity with which they are propelled not only forces them into the soft parts, but compacts those parts so closely together, as nearly to annihilate them ; and the place they occupied is filled by the projected body.

When however, after some time the living fibre recovers sufficient tone, the natural tumefaction which necessarily precedes the throwing off the dead matter, soon produces such a degree of pain, as gives notice of the troublesome guest. Sometimes where the constitution is less irritable, or the wounded parts possess but little sensibility, or where the foreign body is small and polished, or may have formed a secure bed for itself in the belly of a muscle, or in an interstitial space, no derangement whatever succeeds ; and the part heals up as if no extraneous body was present. I shall offer a few curious cases on this subject ; the following was stated publicly at the time of its occurrence :



## CASE.

AT the storming of Seringapatam, Lieutenant F——, an officer of the 12th regiment of infantry, was struck by a spent twelve-pound shot; which, after fracturing the femur and passing between its fractured ends, lodged in the fleshy part of the thigh. So little appearance was there of a body of such bulk, that he was brought from the trenches to the camp, where he expired in a few hours without any suspicion of the presence of the ball, till it was discovered on examination.

The following cases are interesting and instructive.

## CASE.

A SOLDIER of the 95th regiment received a wound from a grape shot at the storming of Badajoz, which entered about the centre of the glutæi muscles of the right side, but without injuring the bones of the pelvis. Very violent inflammation and extensive sloughing took place, and the fever ran so high, that it was nearly five weeks before the patient was free from danger. At the end of that period, he complained of a sense of weight in the thigh of the left side; and, on examination, a slight discolouration and an obscure sense of fluctuation could be perceived. As every attempt at finding the ball had been vain, we began to hope that it had

coursed round under the muscles, and lodged about the point where the uneasy sensation was felt. The man was therefore directed to lie, as much as possible, in a position favourable to its gravitation; and the part was fomented at intervals of four hours. On the second day after the adoption of this plan, evident fluctuation was felt, and a hard body, lying loose within the abscess, could be distinguished when he was placed in a favourable posture; but whenever the limb was moved, it seemed to recede. On the third day, a large ball was plainly felt, lying near the edge of the sartorius muscle, and apparently in contact with the femoral artery; but still receding from it if the position of the limb was changed. I now made a cautious puncture over the site of the ball, which was followed by the discharge of about a pound of very foetid matter, mixed with clots of blood, and a ball of large size could be felt by the probe and finger. The man now fainted, and obstinately refused to permit any enlargement of the opening. As all fear of hæmorrhage from the artery was now over, he was ordered a glass of wine and water, an anodyne at night, and the application of a soft and warm cataplasm to the part. The next day he willingly submitted to a further operation, when an incision being made along the edge of the sartorius muscle, the ball was extracted by one of my assistants with very little difficulty, and his recovery was, from that period, progres-

sive. On examining the ball it was found to be of iron, crusted over with canvas, and weighing eight ounces.

By the kindness of Staff-Surgeon Brownrigg, I saw the following case, which is detailed by Assistant-Surgeon Reid, 25th regiment :

#### CASE.

JOHN BROWN, private 2nd battalion 1st foot guards, was wounded at Waterloo on the 18th of June 1815, by a fragment of a shell, which produced a considerable degree of laceration of the glutæi muscles of the right side, passed over the spine or semicircular edge of the ilium, and lodged itself between the internal oblique and transverse muscles of the abdomen. The orifice of the wound, which was dressed with dry lint, soon assumed a healthy appearance, and shewed a disposition to cicatrize ; but as the patient's health gradually declined, and as he frequently complained of obtuse pain in his abdomen, accompanied by a sense of weight and pressure, there was reason to suspect that these complaints originated in some cause which had hitherto escaped detection. This idea was rendered more probable by the immense purulent discharge which issued from the wound, when the patient was turned on his right side ; the integuments, however, of the abdomen still preserved their natural colour, and no hardness,

swelling, or extraneous body was perceptible to the touch. Three weeks after the injury had been received, the patient informed me, when dressing his wound, that he felt a hard substance in his abdomen, which changed its place to a certain degree according to the position in which he placed himself. He was now visited by Dr. Thomson of Edinburgh, and by Mr. Brownrigg, surgeon to the forces, who agreed in opinion, that an incision should be made directly over the hard body alluded to, which was now distinctly perceptible to the touch, in the centre of the right lumbar region. An incision, four inches in length, and about half an inch in depth, was accordingly made, which enabled the operator, Mr. Brownrigg, to discover and extract a piece of shell, of an irregularly quadrangular form, weighing nine ounces and a half avoirdupois, together with several small pieces of bone, which had been detached from the ilium. The wound was kept open by the insertion of dry lint, in order to promote the discharge from the cavity which had been formed by the piece of shell, and to excite the process of granulations in the contiguous surfaces. The discharge, which was purulent and healthy, now gradually diminished; and the patient's health and strength improved rapidly. On the 20th of August the original wound on the ilium was completely cicatrised, and the purulent discharge from the incision



was almost imperceptible. The patient's health was now quite good ; and, from the favourable manner in which the cure proceeded, I have no doubt but it was soon after completed.

#### CASE.

A MOUNTED Staff Officer, in one of the actions previous to the decisive one at Waterloo, was knocked off his horse by a round shot, which carried away the arm close to the elbow, and inflicted a very extensive lacerated wound on the external part of the thigh of the same side. Amputation of the arm was performed as soon as he got within reach of medical aid, and the thigh was dressed, not without some fears upon the part of the surgeon that amputation of it also would ultimately be necessary. In the great confusion and frequent change of attendants which the exigencies of the service required, the gentleman who operated was not able to continue his attendance, and I was sent for. I found the teguments and part of the fascia of the thigh, and subjacent muscles for about three hands' breadth, dreadfully lacerated, and in a highly irritable and sloughing state, with a thin, sanious, foetid, discharge ; his skin hot and dry ; his tongue covered with a whitish fur, particularly at the back part, and trembling when exposed to view ; the epigastric region somewhat swollen, and tender to the touch ; the eye suffused and intolerant of light ; the sensorium



much confused ; but when his mind was brought to any particular point, he would converse rationally for a few moments, but it was obviously with an effort. I found, from his servant, that he had had no stool for two days, and what he had passed was described as very “ filthy stuff.” I ordered five grains of the mass of blue-pill to be taken immediately, and, in the course of a few hours after, the following mixture, which is the common purgative I use in preference to more elaborate forms ; occasionally adding an aromatic :

R Magnes. sulphat. ʒj.  
Solve in aquæ ferventis, ʒviii.  
Adde vin. antim. ʒj. ad ʒij.

He was directed to take a wine-glassful every hour or oftener, until it operated. A large emollient cataplasm was at the same time ordered to the wound, and I left directions to give him an anodyne at night, with some antimonial wine, if the purgative should have sufficiently opened his bowels ; and to have his skin well sponged with tepid water and a little vinegar. His kind hostess implicitly obeyed all my directions ; and in the morning I had the pleasure of finding all his symptoms much relieved : the skin was soft and cool ; the pulse, which had been above 100, had sunk to 80 ; the tongue had become cleaner, and the discharge from the wound much more favourable ; he had

had several stools, of a blackish, pitchy appearance, and intolerable fœtor.

By the occasional use of the purgative mixture, with the antimonial anodyne at night, he was much amended in a few days ; and at length, after suppuration had been fully established, Mr. Lorimer, the assistant who dressed the case, in cleaning the sore on the thigh, discovered an extraneous substance deeply imbedded in the vastus externus muscle, which, on removal, proved to be his pantaloon pocket, of coarse linen, containing two five-franc pieces and two small copper coins. I need scarcely say, that, after such an injury in a constitution debilitated by former severe wounds, the recovery was very slow, and the irritability excessive, although great relief was obtained from the extraction of those articles.

#### CASE.

A HANOVERIAN soldier received a severe wound from a grape-shot on the 18th of June 1815, at Waterloo, which struck him on the external part of the thigh, producing very extensive laceration. On the second day he was brought into the hospital, and the usual dressings applied. On the fifth day a long narrow passage was discovered by the probe, seeming to run nearly the whole length of the vastus externus muscle. On cutting into this, three pieces

of coin (which, from the very curious mode in which they were compacted together, I thought worthy of presenting to the Director General of Hospitals) were extracted from the parts. This poor fellow, a raw recruit, had no money whatever about him, nor even a pocket to contain it in, and fervently protested against his right to this forced loan. He accounted for it by supposing it carried from the pocket of his comrade, who stood before him in the ranks, and who was killed by the same shot.

The coins, consisting of two five-franc pieces and a Dutch stiver, were obviously first struck by the shot, and carried along by it; for nearly one half of their flat surfaces, the silver pieces adhered closely together; on the other, where the ball had struck their edges, the metal was flattened out and somewhat hollowed. In this hollow lay the copper coin, in some degree adapted to the shape of the depression on the larger pieces.

I cannot omit noticing here a trait strongly illustrative of the mobility of mind which characterizes soldiers, and their proneness to superstition and belief in omens, which a surgeon acquainted with their character can often turn to their benefit. The part of those two coins which had been flattened out happened to be that on which Napoleon's head was impressed. From one it was nearly effaced; and on observ-

ing this circumstance to the patient and his comrades, an universal burst of joy echoed through the ward ; the young Hanoverian exulted in the share he conceived he had personally had of contributing to the downfall of the French Emperor. His health rapidly improved, and I have no doubt that this simple circumstance had a good effect upon every man who witnessed it.

#### CASE.

A SOLDIER of the 52d regiment was wounded at Badajoz by a ball, which carried off his arm. He lay for some time in the breach among the heaps of his wounded comrades, the enemy keeping up an incessant fire upon them. When brought into the hospital at Elvas, several fragments of the bones of a cranium were taken from a lacerated wound on his thigh.

#### CASE.

A FRENCH officer of the German regiment of Nassau was wounded at the same siege ; his fore-arm was dreadfully lacerated, and, gangrene supervening, it became necessary to remove the limb above the joint. In the bend of the elbow a piece of bone was found, firmly imbedded, which, on examination, proved to be part of an ulna and olecranon of another person that had been driven in by the ball.



## CASE.

On extracting a ragged angular musket ball from under the temporal fascia of a Sergeant who was wounded at Burgos, Staff-Surgeon Hughes, then of the Portuguese service, felt what he supposed to be a bit of loose bone ; but, on withdrawing it with his forceps, it proved to be the body and crown of a bicuspid tooth of the soldier who stood a little in front of the Sergeant, and who, wounded by the same ball, had almost all the teeth of the left side of the under jaw fractured and carried away.

Examples of this kind are still more frequent in naval actions, proceeding from the crowding and more irregular formation of the combatants ; and some officers now alive have been the subjects\*.

It would be superfluous to give more instances of this kind, especially as I shall have to offer some more remarkable ones in treating of particular wounds. I shall therefore proceed to a few practical observations on the subject.

The experience of all ages has confirmed the dictates of common sense in giving the preference to the finger, over all other instruments, for probing a wound. By a judicious tact the

\* Admiral Duckworth, Sir Edward Berry.



state of the parts, and the nature and site of the extraneous matter, can be generally ascertained, and foreign bodies removed or brought within safe and easy reach of the dressing forceps ; particularly in the limbs, where counter pressure will much assist us in bringing forward the parts more immediately to the point of the finger. In doing this, the limb should be relaxed, and put into a position favourable to the gravitation of the ball, &c. towards the surface, if it can be done without much pain ; and, if no serious inconvenience follows, the patient may be placed, as recommended by all the older surgeons, in the position in which he received the injury ; but in many cases this is impracticable, and in none indispensable, although the practitioners of former days attached such value to it, that in some instances, if the wounded man happened unfortunately to be a trooper, they placed him on horseback to facilitate the extraction\* of the inflicting body ! Fully to answer every purpose expected from this plan, not only the posture of the wounded man, but that of his assailant, should be determined.

The Surgeon should never omit a moderate search after extraneous bodies at every dressing,

\* Vide Gesner's "*Observat. de Chirurgiæ dignitate et præstantia*," as quoted by Wiseman, p. 324. Fol. ed Lond. 1705.

if he has evidence or suspicion of such being in the wound. A casual visitor may, without this precaution, frequently snatch from him the praise due to a long and assiduous attention ; for it not unfrequently happens, that, after the most particular and cautious search, some accidental movement of the patient, or some internal revolution in the wound, either tumefaction or profuse flow of matter, will bring the substance lodged, within our reach ; nay, it is often spontaneously discharged, and found enveloped in the dressings or poultice.

It often happens also that extraneous bodies remain for years without inconveniencing the patient in the smallest degree ; sometimes in the spot where they originally lodged ; sometimes making occasional deviations, and at others taking such courses as are not at all to be anticipated, indeed often contrary to every calculation.

Authors abound with histories of extraneous bodies, presenting at points not only different from that where they entered, but at points where they must have arrived, contrary to the laws of gravitation, and influenced only by the action of the muscles\*. If they lie, which

\* Vide, particularly in the Philosophical Transactions, abridged by Hutton, Shaw, and Pearson, vol. xii. p. 590. cases of pins swallowed, and discharged at the shoulder ; and a

smooth leaden balls are particularly apt to do, without giving pain, they ought never to be removed; when they come from their lurking places, and present at the skin, or near the surface, the extraction becomes a matter of great simplicity.

Except the ball or other foreign matter is completely in our power, we should never use the knife to enlarge the wound, or promise a certain extraction, however urgent the patient may be; for as nothing is more cheering than presenting him with the ball, so nothing is more disheartening, or tends more to shake his confidence in his medical attendants, than a disappointment under those circumstances.

Some useful information may be drawn from the appearance of the ball, as to the nature of the matter carried in by it, or of the injury it may have inflicted upon the bone. Shreds of cloth, the metallic particles of an epaulet, a piece of lace, of breast-plate, or other ornament, are frequently found solidly imbedded in it; and these appearances may lead us to a more certain know-

needle in the left arm of a woman, discharged at the right breast, by Dr. Lysons of Gloucester. A case is given by Gasparetti, in his "*Ozzervazioni*," of a piece of glass, after nine years, shifting from one hand to the other: and numerous instances of articles swallowed, and passing out by the muscles, bladder, vagina, neck, and region of the liver, may be found in Valisneri Opera, tom. i. p. 360; and by Silvy in *Memoires de la Société Medicale d'Emulation*, An. 5, p. 181.

ledge of the existence of foreign matter in the wound.

A leaden bullet also occasionally leaves a part of its own metallic composition in the wound, as it is frequently split, or cut to various depths against the sharp edge of a bone, as the tibia, vomer, &c. or against the remaining sound edge of the cranium after effecting a fracture in it: not unfrequently the fragment is found at a distant point, and sometimes in situations where no such event could be anticipated. The following case is a curious illustration of this fact:

#### CASE.

A SOLDIER of the corps of Brunswick Oels was struck at Waterloo by a musket-ball on the tip of the nose, which split upon the bony edge where it is joined by the cartilage. A piece of the ball was extracted on the spot, and it was supposed that the ball itself had been purposely cut into pieces, as is sometimes done by foreign riflemen. The cure went on without accident until the tenth day, when the man was seized with a violent hæmorrhage from the mouth and nose, which came on suddenly, and carried him off in the course of the night. On dissection, it appeared that a part of the ball had penetrated along the basis of the skull, and lodged in the sinus of the left internal jugular vein, forming a

sort of sac for itself close upon the vein, which having inflamed, the coats of the vessel at last ulcerated and burst.

Balls also sometimes split without being mechanically cut, possibly from a flaw in the casting. Thus in a case to which I was called at Brussels, by my friend Staff-Surgeon Lindsay, he found a part of a ball lying in a fracture of the os frontis, which it had obviously struck directly in front, without at all interfering with the edges of the sound bone. The case terminated successfully after the application of the trephine.

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#### OF CONTUSIONS AND OTHER SERIOUS INJURIES FROM SHOT AND SHELL.

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BESIDE those slight injuries effected by the passage or the lodgment of a ball or pieces of shell, the most serious consequences at times result from them. These may be arranged under the heads of severe contusions or concussions, and their effects; fracture and disorganization of the bones, and injuries of the blood-vessels,



nerves, and apparatus of the joints, which are not of such a severe nature at first as to justify the removal of the limb.

It very often happens that while all is smooth and sound to the eye, or there is perhaps only a slight erosion of the skin, a very serious injury has been done to the subjacent parts. This is more particularly the case where a spent ball of large size grazes along any of the cavities ; or where they have received a severe injury from the running over of a gun, or the explosion of an ammunition waggon, or other violence ; on all these occasions, great advantage will be derived from taking a few ounces of blood from the arm, and embrocating the contused part with some linimentum saponis or any other mild stimulant. If the vitality of the part is not entirely destroyed, it will soon be relieved ; but where that is the case, a circumscribed tumour, soft and pulpy to the feel, forms on the spot ; the skin, at first of a natural colour, gradually assumes a dusky shining hue, and either sloughs off, leaving beneath a dark glossy flabby muscular mass, discharging tenacious bloody sanies ; or else a chain of ill-conditioned abscesses forms, which soon run into one another, and burrow deep beneath the disorganized mass of skin and muscle, if not prevented by timely evacuation. There are two points to be most particularly attended to in these cases ; first, the external ap-

plication used as a discutient should neither be purely sedative nor powerfully exciting, but of a mildly stimulant nature ; otherwise the whole surrounding parts will be overspread with an erysipelatous inflammation, and their vitality will be destroyed. Secondly, when the effusion of blood or formation of matter is clearly ascertained, it should be removed with the strictest attention to the rules of art, particularly as they regard smallness of aperture and cautious exposure to the air ; otherwise an accident easily remedied by proper treatment in the beginning, may ultimately prove fatal. The following melancholy case will illustrate this :

#### CASE.

A GALLANT artillery officer received a contusion from a spent round shot at the battle of Vittoria, which struck him exactly between the scapulæ, barely leaving a discolouration of the skin, and a slight stiffness of the parts. To this he was advised at first to apply cloths wet in a saturnine solution, which he gradually increased in strength. He derived, however, very little relief from this mode of treatment ; the stiffness still continued, the discolouration increased, and he was advised by some casual visitor to apply a blister to the part. In an evil hour this advice was acceded to, and, in a very few days, the whole back down to the lumbar region was

covered with a dusky erysipelatous inflammation. In a day or two after this appearance, an abscess formed on the part where the ball had struck, and another a few inches lower down, over the spinous processes of the vertebræ; the surgeon who attended unadvisedly laid open the tumour in its whole extent. I saw the patient in conjunction with Assistant-Surgeon O'Beirne, on the thirtieth day from the receipt of the wound; he was then emaciated to a great degree, his pulse beyond 120, his skin hot and flushed, his tongue foul, appetite almost gone, and his strength so reduced, that he could not sit up without support. On opening the wound, the smell was almost insupportable, and the discharge, a thin acrid sanies; the opening was of about four inches long, the edges hollow and flabby, the bottom smeared with a greyish, tenacious, purulent matter; through which, at different points, appeared dusky specks of muscular flesh, and some bits of tendon. At some points, the spinous processes of the vertebræ could be distinguished through a thin covering of this glairy fluid, and the angles of one of the scapulæ had eroded a hole through the skin, which lay loose all around the sore for several inches; the destruction of the parts was evidently going on beneath, and a sort of bag, composed of the separated teguments, and filled with the same matter as besmeared the wound, was formed at

its lower part near the sacrum, which the assistant had just punctured in a depending position, to prevent any further accumulation. Under those desperate circumstances, little could be done ; the constitution had almost sunk beyond the powers of art ; it was resolved, however, to remove him from the hot and unwholesome air of Vittoria, by easy journies, to the sea coast of Biscay, to which I was then proceeding on duty ; and to continue the infusion of bark, with sulphuric acid, which he had been for some time in the use of, and dress the wounds with mildly stimulating applications. In spite of every effort for his preservation, layer after layer of muscle peeled away, till at last the whole surface of the sore became completely coated with masses of coagulated blood, oozing from the mouths of the vessels at all points ; and in fifteen days, death closed the scene.

In all cases of this kind, the parts struck by the ball or other body are, to a certain extent, deprived of their vitality, or even completely killed ; and the principles of the cure are the same as those which guide us in the removal of a dead part, from any other cause. The cure is always slow, and the proper treatment consists in moderately stimulant external applications, as camphor, volatile alkali properly di-



luted, spirituous fomentations, &c. ; and a liberal diet, wine, preparations of bark, and pure air.

To apply strong saturnine solutions, or leeches, to a part under these circumstances, is extremely injurious, because they tend to depress still more the powers of life ; to over-stimulate by blisters, is equally destructive of the vitality of the parts and more hurtful to the general constitution.

The effects of severe blows by spent or oblique shots striking the head, thorax, and abdomen, are still more dangerous, both from the violent concussion they give the spinal marrow and the different organs contained within those cavities, and the rupture of vessels, or the disorganization of parts, which they produce ; in which latter cases they are invariably fatal.

This concussion is various in degree, proceeding progressively from the involuntary tremour and shuddering consequent on a flesh wound, to partial, or universal spasm, suppression of urine, involuntary stools, vomiting, jaundice, nervous tremours, great irregularity and lowness of spirits, (which in some particularly irritable habits, cease only in death,) loss of hearing, sight, speech, and even of life itself, when the head or spine are the parts peculiarly affected. Under this class is to be ranged death from the wind of a ball, which has given rise to such a multiplicity of fables, and on which so much



argument has been exhausted\*. I should be very far from denying altogether the influence of the shock, whether that is electrical or not; because we frequently meet with cases where no local injury can be detected after death. That the compressed air alone, or the friction of the ball has no such effect, appears to me satisfactorily proved by the usual arguments, drawn from instances of near comrades being killed, or parts of the body torn off without the individual being destroyed; and it is rendered, if possible, still stronger by instances of escape, owing to a sudden contortion of the body, in evasion of the summary military punishments inflicted in some foreign countries, by blowing men off from the mouth of a gun. The two following cases are, I think, worth notice; death was occasioned in both by the same ball:

#### CASE.

A SLIGHT lad, of about 24 years of age, was employed on a fatigue party at the fort of Puntales, in advance of Cadiz, when the enemy from the opposite fort of Matagorda, about 1000 paces distant, opened a very heavy fire. A 24-lb. shot struck a sand-bag which he was carrying on his

\* Vide some ingenious papers in the Edin. Med. Journ., vol. viii. pp. 1, 161, 310. Vacher, in Mem. de l'Acad. de Chirurg., &c. Sur quelques particularités concernant les playes faites par les armes à feu, tom. ii. 12mo.

head towards a new traverse throwing up in the works ; he immediately fell, and was brought to the barracks, about a mile distant, and placed in the hospital. On examination, no morbid appearances could be traced, except a derangement of the hair, extending along the sagittal suture, and about two inches wide, much resembling its appearance in a person placed on an insulated stool, and subjected to electricity. The pupil of one eye was considerably dilated ; the other preserved its natural contractile power : his face was pale, his limbs cold, a clammy sweat bedewed his whole body, and he lay quite insensible ; his pulse was soft, compressible, and reduced to 50 beats in the minute, but without any intermission ; his breathing slow, but uniform, and without any stertor ; his efforts to vomit were incessant, but frequently unavailing. In this state he remained for twenty-four hours, when he expired in a violent and general convulsion. On first receiving the injury, he was bled, by an assistant on duty in the fort, to about sixteen ounces ; and on his passage to the barracks he lost some more blood by the loosening of the bandage. On his arrival some Madeira was forced down his throat, and ordered to be continued to the quantity of a wine-glassful at intervals of two hours. On examination of the body, not the most trivial morbid appearance could be detected in the head, nor any derange-

ment whatever in either the thorax or the abdomen, where I expected to discover the rupture of some large vessel, or severe injury to the liver, spleen, or some other viscus.

#### CASE.

THE same ball struck a soldier of the 30th regiment on the right breast, brushing along the pectoral muscles, but without raising the skin, or occasioning any fracture of the bones. He lay stunned for some minutes, and was then carried on a bearer to the general hospital. I had not an opportunity of seeing him that night ; but the next evening I called at the Hospicio, where I found him evidently dying ; his face bloated, and of a purple hue ; his eyes starting from their sockets, his respiration excessively rapid, and his pulse feeble and almost beyond counting ; in fact, he died thirty-six hours after the accident, with all the symptoms of suffocation. On examining the body, the vena azygos was found ruptured, and also the intercostal artery of the fourth rib of the injured side ; and two pounds of blood were extravasated in the cavity of the thorax.

In many cases of death, both on the field and after arrival at the hospital, we find lesions of the liver, of the spleen\*, or other abdominal

\* Vide Morgagni, Letter 54th ; and some very interesting cases and dissections by Dr. Chisholm, in the *Edinb. Med. and Surg. Journal* for July 1811, vol. vii. page 257.

viscera, and rupture of the mesenteric arteries, and sometimes of the intestines themselves, from the violence of concussion.

I give the two following cases, (although they did not occur on the field of battle, nor in consequence of gun-shot injury,) as they are sufficiently interesting in themselves, and as they are fully illustrative of the symptoms and most rational mode of treatment for those highly dangerous accidents, as well as of the morbid appearances on dissection. I owe them to my lamented friend Mr. Steele, late of the 23d dragoons. The first is in the words of the reports made at the bedside.

#### CASE.

JOSEPH RICHMOND, aged 21, was admitted into the hospital on the 28th of July 1811, having, about an hour before, received a violent kick from his horse on the superior central part of the hypogastric region; he feels much pain in the part, and it bears a red mark corresponding with the shape of the horse's shoe; he is unable to void his urine, and it is probable, from the feel, that there is much of that liquid in the bladder. The catheter, therefore, was introduced with ease, and about twelve ounces of urine discharged, which was of the natural colour. He was bled to eighteen ounces, a sa-



line purgative was ordered, and the abdomen was fomented assiduously with a decoction of chamomile.

*Evening visit.*—The pain has been considerably relieved ; and he has slept soundly since he was bled ; his pulse is 80, and soft ; he voided his urine naturally about an hour ago ; he has vomited three or four times ; he has not been purged. Let the bleeding be repeated to eighteen ounces ; let him have a spoonful of liquor ammon. acetat. every third hour, and barley-water ad libitum ; continue the fomentation.

*July 29th.*—He was visited at nine o'clock last night, at which time he was suffering severely from acute shooting pains in the hypogastric and umbilical regions ; his pulse was hard, and his bowels were constipated. He was bled to eighteen ounces ; enemas were thrown up, and repeated until several copious evacuations by stool were produced, and the griping pains were relieved. He has had a return of the pain this morning : he is at present free from it ; but there is considerable tension of the abdominal region : he has just had a copious evacuation by stool, of the natural appearance ; he sometimes has an attack of vomiting, but it is not violent. Let him lose twenty-five ounces of blood, and continue his medicine and fomentation.

*Evening visit.*—The pain in the abdominal region returned about noon, and has continued



with considerable violence during the evening, and is at present very severe. The swelling, hardness, and tension of the abdomen have increased considerably during the day; his pulse is intermitting, low, and tremulous; it is also very quick; his countenance has assumed a leaden hue; he has frequent retchings, and he sometimes vomits up a greenish-yellow matter; he is very restless, and thirsty; he passes his urine freely; his stools are copious, and evacuated without difficulty. Let him be immediately put into a warm bath; after which, let a blister be applied to the abdomen, and injection of decoct. of lintseed be thrown up every two hours.

*Eight o' Clock.*—The warm bath produced a general diaphoresis, and an alleviation of the acute pain in the abdomen; the swelling and tension of the abdomen were also considerably reduced: his pulse, however, was not raised, and it continues very quick, weak, tremulous, and intermitting. His breathing is become short and laborious; he has had one evacuation by stool since he came out of the warm bath; he has had no return of vomiting since six o'clock. The pain having been relieved by the bath, the blister was not applied. He has just now taken half a pint of warm gruel, with about an ounce of wine and a little sugar: this is to be repeated every two hours, and the fomentation and glyster continued.

*Ten o' Clock.*—During the last two hours he has laboured at the verge of dissolution; his breathing has been short and difficult, and his pulse imperceptible to the feel. The extremities have been cold; but the temperature of the rest of his body considerably above the natural standard: he has been exceedingly restless, anxious, and apprehensive; he has taken his panada regularly; has had some retching and frequent eructations; he has had one fit of vomiting, and he threw up at least two pints of green bilious matter. With the view of supporting the powers of life, the extreme prostration of which has been strongly indicated by the coldness of his extremities and failure of his pulse, together with his anxiety and difficulty of breathing, he has taken a little volatile alkali and tincture opii in small doses. The temples have been rubbed with liq. vol. c. c. which has also been applied to his nostrils. These remedies, with the occasional administration of panada, are ordered to be continued.

*Eleven o' Clock.*—He is much worse in all respects; his pulse, during the last hour, could not be felt, and the coldness of his extremities has increased. His difficulty of breathing has also increased considerably; his countenance exhibits a deadly pale colour, and his lips are blue; he swallows with much difficulty, and his anxiety is extreme; the pulsations of the tem-

poral artery can be felt ; it is at 120, low, and feeble. At twelve he died.

*Appearances on dissection, July 30th.*—The abdomen having been opened by a crucial incision, the first remarkable circumstance which presented itself was an immense quantity of effused liquid, mixed with fæces ; and it was soon discovered that a rupture of about an inch and a half in extent had been made in that part of the intestinum ileum which crossed the cavity of the abdomen anteriorly, about two inches below the umbilicus, and immediately opposite the part which bore the mark of the horse's foot. The whole of the intestines were exceedingly vascular, from the violent inflammation which had taken place ; but this was more particularly remarkable in the convolutions of the ileum, which was wounded by the blow. A considerable quantity of coagulable lymph had been effused by the vessels communicating with the wound : a small quantity of pus was also visible ; the whole of the omentum was uncommonly red, with great turgescence of its vessels ; the bladder was found perfectly sound, empty, and collapsed ; the stomach and liver were perfectly free from disease ; the gall-bladder was distended with bile.

## CASE.

SAMUEL HOLT met with an accident nearly similar to that detailed in the former case, and the treatment was conducted upon the same plan ; but in spite of every remedy that could be employed, he sunk in twenty-two hours and a half after he received the blow.

On the contents of the abdomen being exposed, a large circular hole was discovered in one of the convolutions of the jejunum. It was situated in contact with the peritonæum, about two inches obliquely below, and to the right of the umbilicus. The fibres of the intestine surrounding the hole, had the same appearance as is generally presented by the margin of a recently contused wound ; the whole of the small intestines had a bright-red colour from the numerous ramifications of their inflamed vessels. That part of the canal extending a few inches above and below the hole, was remarkably inflamed ; and the vessels had already secreted a purulent-like matter, which adhered to the surface of the intestines in its vicinity. About two quarts of yellowish fluid was extravasated in the pelvis, and among the convolutions of the intestines ; the peritoneum was highly inflamed, to a considerable extent, in the neighbourhood of the injury. The bladder was empty and collapsed, as were also the large intestines.



In both those cases it is remarkable, that the blood drawn from the arm is not stated to have been covered with buff.

On some occasions, the appearances on dissection do not so satisfactorily account for the symptoms during life ; and in others, we are left in total obscurity. The following case occurred in a civil hospital of great celebrity :

#### CASE.

A MAN, about sixty years of age, was brought in, in consequence of having been run over by a carriage. The wheel passed over the iliac and hypogastric regions. He felt acute pain on pressure, but no other symptom of inflamed bowels ; on the contrary, their functions remained natural and undisturbed. Next day he was bled to twenty-four ounces, which relieved the pain and reduced the pulse ; but very shortly afterwards it rose to 140, full, and somewhat hard. Venesection was repeated the next day to twelve ounces. Pain still continued ; and on attempting a repetition of the blood-letting, none could be procured from the arm. He died on the fourth day from the accident. On dissection, a quantity of dark-coloured blood was found effused under the peritonæum covering the abdominal muscles in the iliac and hypogastric region, and some in the pelvic region. The cellular membrane about the pubes was particularly injected



with it. The peritonæal coat of the intestines was somewhat more vascular than common ; but not the slightest symptom of inflammation or organic lesion could any where be traced.

I may here remark, that death often succeeds to injuries apparently superficial; in which the brain seems to suffer sympathetically merely from their *extent*, favouring the idea of those who consider the whole nervous system in the light of expanded brain.

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#### INJURIES OF THE BONES.

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I SHALL now make some observations on injuries of the bones of the extremities, the joints, and their appendages ; a train of accidents which are of the most serious importance, highly dangerous to the patient, and demanding the most cautious management and sedulous attention from the surgeon. Very seldom, under the most favourable results, do they afford either to the patient or his attendants adequate compensation for all the miseries and accidents of a tedious and protracted cure. Still, however, the preservation of a limb, where

any rational chance of saving it exists, must be a serious object to the patient, and a desirable result for the surgeon. I have already observed, that some information may be derived from the appearance of a ball after being cut or extracted from a wound. Where it has brushed obliquely by a bone, and injured its external plate, its surface is often jagged, and presents the appearance of a file clogged with raspings of ivory. Sometimes it is flattened against the bone without doing such material injury to the periosteum as to occasion exfoliation ; but more frequently, long and tedious throwing off of scales follows the injury. In some cases it will take out a portion of the diameter of the bone ; and in others, though more rarely, perforate the shaft completely without entirely fracturing it. More common instances of this perforation occur in the spongy heads of bones, as the humerus and tibia ; in all these cases the injury is comparatively simple in the recent state, and our duty is confined to watching the approach of inflammation, and removing any splinters, &c. that may present or come within our reach. In their after-stages, however, these perforating wounds of the cylindrical bones become of most serious import, and almost constantly turn out cases for secondary amputation.

In some severe cases, where the ball lodges in the bone, particularly about the condyles, by

making deep and cautious incisions before great swelling of the soft parts comes on, we may occasionally succeed in removing the metallic mass with a forceps, either unaltered, or beat out into irregularly angular shapes. Sometimes, however, it is so firmly fixed, that it can be removed only by sawing the bone, by the crown of the trephine or other instrument. The accident is always highly serious ; but it is possible, under circumstances of peculiar good fortune in a temperate subject of sound constitution, to save the limb by the operation, as in the following case :

#### CASE.

JOSÉ DE SANTOS, a quarter-master in the 9th Caçadores, passing along the bridge of Burgos on the 27th of September 1812, was struck by a musket-ball on the outside of the knee, which brought him to the ground. "I found him," says Staff-Surgeon Hughes, "at the Hospital Del Rey, about three hours and a half afterwards, in great pain ; the parts surrounding the joint swelling rapidly, and a Portuguese surgeon endeavouring to persuade him to suffer amputation. The ball was lodged and could not be found, although the wound had been a little dilated to facilitate examination. Measures to subdue inflammation were immediately adopted ; on the morning of the 28th he had a violent shivering fit, and another at midnight ;

“ copious suppuration was found to have taken  
 “ place on the 29th, with an abatement of pain,  
 “ and the ball was easily felt, but immoveable,  
 “ and seemingly stuck in the bone. Poultices  
 “ and fomentations were now applied ; and on  
 “ the 1st of October, I found he had had another  
 “ shivering fit the preceding night, and that a  
 “ piece of cloth had come away with the dis-  
 “ charge, which was much increased. This  
 “ evening he was attacked with diarrhœa, and  
 “ vomited some bilious matter ; the suppuration  
 “ now became profuse, the diarrhœa grew pro-  
 “ gressively worse, and his rigors continued to  
 “ return with an exhausting purulent discharge  
 “ until the 7th, when amputation was again pro-  
 “ posed, as the only means of preventing a ra-  
 “ pidly fatal termination ; but he persevered in  
 “ his resolution to prefer death to this operation.  
 “ As the only alternative, I extensively dilated  
 “ the wound down to the bone, when the ball  
 “ was found fixed in the centre of the external  
 “ condyle of the femur, nearly a quarter of an  
 “ inch below the bony surface. The crown of a  
 “ trephine was now applied, and a flattened ball  
 “ was extracted, with several portions of cloth.  
 “ Light dressing was applied, and next morn-  
 “ ing it was found he had escaped his shivering  
 “ fit ; his diarrhœa was abated, and he had en-  
 “ joyed sleep ; which, since the first day of his  
 “ wound, had been nearly a stranger to him.



“ The discharge continued gradually to decrease, and his health to improve ; and on the 22nd, (when circumstances caused the removal of the wounded,) the parts were healing rapidly, and anchylosis taking place. He bore his journey in a waggon well ; and, when discharged from the service three months after, was in good health, and had a tolerably straight knee.”

Where a ball has lain long in the bones, the cancelli break down and admit of its rolling about in the cavity, if it still retains its rotundity. Nothing short of an operation, with the head of a trephine or saw, can, in this case, possibly remove it; the contraction of the orifice by irregular points of ossification confining it completely within the bone\*. There are some instances on record where the ball has remained quietly in this situation so long as twenty-five years ; but in the majority of cases, a majority so vast as to admit of no shadow of comparison, the violence of the inflammation, the excruciating pain, the profuse suppuration, diarrhœa, and fever, lead to the removal of the limb as the only chance of recovery†.

\* Vide Percy, *Manuel du Chirurg. d'Armée*, p. 96.

† My friend, Mr. Vance of Haslar, who is very rich in specimens of bones injured by gun-shot, has an excellent in-



A curious instance of a ball lodging in bone is given us by Parè. It is a very rare occurrence, but the case is valuable on many accounts. "The King of Navarre," says he, "was hurt with a bullet in the shoulder a few days before the assault of Rouen, anno 1562. I visited and helped to dress him, with Master Gilbert of Montpellier, his own surgeon, and others; they could not find the bullet; I searched for it very exactly; I perceived by conjecture, that it had entered by the head of the *adjutorium*, and that it had run into the cavity of the said bone. The most part of them said it was entered and lost within the body. Monsieur, the Prince of Roche-upon-Yon, who intimately loved the King of Navarre, called me aside and asked if the wound was mortal. I told him yea, because all wounds made in great joints and principally contused ones, were mortal." Parè remained steady to his prognostic, always declaring that the limb would fall into gangrene, which it did, and the King died on the eighteenth day after the wound. A dissection was ordered,

stance of this contraction of the orifice. In the brute creation, under certain circumstances, it closes altogether, and little inconvenience seems to be felt; thus, on cutting pieces of ivory, metallic balls are sometimes found bedded within them without any mark of their entrance. They must obviously have entered the pulp before the secretion of enamel, to cover the adult tooth, had taken place.

and, much to the honour of Parè, the ball was found in the very middle of the cavity of the os humeri. He concludes the case by saying, that he returned to Paris, where he dressed several of those who were wounded at the siege. “There  
 “ were divers,” says he, “ that recovered, and  
 “ others died. I believe,” he continues, (emphatically addressing Gourmalin, a Volunteer Critic of that day, whom he invariably calls the Adversary,) “ I believe, my little master, you  
 “ were called in to dress some of them, for the  
 “ great number there was of them\*.”

In a case of this kind, where the track of the ball is clearly ascertained, no delay can be admitted of, nor no operation can succeed, except that at the joint.

But the most serious accidents of all are compound fractures of bones, particularly the Femur; that bone whose fracture, as observed by Pott, “ so often lames the patient, and disgraces  
 “ the surgeon.” Every thing connected with these injuries is worthy of the most particular attention; they are, like fractures from other causes, various as to their situation and their complexity; the bones are either broken transversely or in an oblique direction, or they are fractured in two or more different places; or again, as in the fore arm and leg, one of the bones only is injured, while the other remains

\* The Voyage to Rouen, 1562, lib. 29. Johnson's Translation.

entire, and preserves the form of the part. The principle of reduction, coaptation, &c. &c. is the same as in fractures from ordinary causes; but the sources of irritation are infinitely more numerous and more complicated; and the shock occasioned by the injury spreads to a much greater extent, and seems to implicate the whole system.

The ends in view in remedying these cases, are sufficiently obvious; the means are still a subject of discussion. One of the most powerful modes of restoring the use of the limb, is its posture; and even in this necessary preliminary, the greatest differences of opinion prevail. The bent and the extended position of the limbs has each its advocates. Much as English surgery owes to Mr. Pott, it is chiefly indebted to him for his excellent remarks on Fractures; he first placed in its proper point of view the rational mode of evading or moderating the powerful action of the muscles. The posture recommended by him has, for years, been adopted as the proper one in British practice; in France, however, a directly opposite mode is pursued, and not without considerable success. It was handed down from the first dawn of rational practice in that country in the days of Parè; and it is a curious coincidence, that the very opposite modes of treatment recommended by those two most eminent men, were illustrated

in their own persons, each suffering a severe compound fracture of the limb, and each submitting to, and directing the application of, the rules they had laid down for the treatment of those accidents\*. The relaxed position of Pott was carried by himself to the very highest state of improvement; but Parè's was progressively amending from his own time down to that of Desault and Boyer. A due consideration of both the methods will, however, shew us, that in neither are all the muscles fully relaxed; and we are in both obliged to a certain extent, to paralyse them by our pressure, and by our long-continued extension. In cases so tedious in their cure as gun-shot fractures, the question will, in some degree, resolve itself into one of convenience to the patient and his surgeon; and I am warranted, from most ample experience, to infer, that lying on the back with the limb extended, is by far the most tolerable to the patient, and admits of much easier access and dressing; and, what is still more important, is, in its ultimate success, equal, if not superior, to either the bent position of Pott, the patient on his side, or the semiflexion of the knee, the patient on his back, and the limb in a fracture box, as recommended by Mr. Charles Bell† and others.

\* Vide Parè, lib. xv, chap. 23 and 24, and Pott's Life, prefixed to his Works, by Earle.

† Vide Operative Surgery, vol. ii. p. 346, Ed. 2 Lond. 1814.



In mentioning the removal of those cases from the field, I recommended that, after the bones were placed in as close apposition as the nature of the case could admit, and properly secured, the limb should be laid in a relaxed position ; this relaxation preparatory to a move, or pending the violent inflammatory re-action which is certain to come on in a few hours after the receipt of the injury, is by no means intended to be continued through the whole period of the cure ; indeed it has become a question with some able surgeons, whether, if the compound fractures could be set at the moment of infliction, and the proper apparatus for continued extension was at hand, it would not be adviseable at once to put them in position. In many situations this is utterly impracticable, from the nature of the service, from the violent spasmodic action of the muscles of the limb, and sometimes, though more rarely, from the obstinacy of the patients themselves.

But, very fortunately, the position in which the limb may be placed on the first infliction of the injury, is by no means of such consequence to the future recovery of the patient, as, from reasoning *a priori*, we might be led to suppose. Chance, which has such frequent and powerful influence over us, perhaps originally suggested what Experience has fully proved to be founded in truth ; and in no situation can those fortuitous



occurrences more frequently present themselves than in military practice. Here the inexperienced surgeon, reduced almost to despair at the want of all the comforts and conveniences of the establishments of a rich metropolis, and anticipating his patient's destruction and his own disgrace, will gradually discover that utility is often made subservient to shew where the means abound; while, with all their privations and inconveniences, and with their exhausted supplies of even the most common materials, the converse of the fact is demonstrated in army hospitals.

The situation of a wounded soldier on a field of battle is pitiable in the extreme: with every means and every wish to relieve, surgical aid cannot be immediately offered to the sufferers, from the nature of the operations carrying on. Hence it is that frequently both victors and vanquished lie for hours undressed in indiscriminate heaps.

After some of the skirmishes in the Pyrenees and near Pampeluna, subsequent to the battle of Vittoria, we received into the hospitals of that city several compound fractures, (particularly into the church division of St. Domingo Hospital, which was principally filled with those cases under my charge,) the majority of which had been barely dressed with the common splints and rollers; some had been left undressed for

many hours ; and none were placed in the regular position for some days after, (in not a few instances for so many as twelve or fourteen,) having for part of that period been *in transitu* to the hospital, and during the whole time the inflammatory symptoms running very high. At Brussels, after the action of Waterloo, the excruciating torture brought on by the slightest attempt at setting the limbs, was, in some instances, very remarkable, but subsided on the use of antiphlogistic remedies and quiet, when they were placed in proper position ; and in one case of a German soldier, with a fractured femur, the spasmodic contraction of the limb was so great, that the slightest touch produced the most exquisite agony. In this case the muscular action was so violent, that the limb was twelve inches shorter than natural when I saw it, and proportionally thickened ; it had been much more so ; and I am convinced any violence would have produced an immediately fatal termination. By a soothing plan, a sufficient extension was generally admitted of in some days in all those cases.

In the same action a young officer, Captain G.—, was not placed in position before the 23d day. The circumstances of his case, as far as connected with my present purpose, were briefly these:—A musket ball passed into the upper portion of the middle third of the thigh, through the os femoris, and out in a nearly

straight line, splintering both ends of the bone extensively. Four days elapsed before he was brought to Brussels and safely deposited in my house, during which period no dressing had been applied ; in fact, the clothes in which he had been wounded remained on him to the eighth day, contrary to every persuasive argument that could be used with him. When he did submit to have the limb placed in a proper position, it was effected in so short a space of time, and with so little pain and inconvenience, that he would not believe that I had even commenced the attempt.

These few instances, selected from a vast number, sufficiently shew, that immediate extension, coaptation, &c. are not applicable in all cases ; neither are they absolutely necessary to the present comfort or future safety of the patient. To which also I may add, that, having been principally employed in the Peninsular war, and in the campaign of the Netherlands, in the fixed hospitals, I have consequently had ample opportunities of viewing the state in which the fractures arrived from the field. And, although in many, the hands of a master were easily recognized in the mode of dressing, in none did I ever see the limb in such a state as to preclude the necessity of going over all the steps of resetting, and consequently of redoubling the patient's anguish.

I shall briefly state what appears to me the most rational mode of treating these very complicated injuries, and which I exclusively adopt, from a conviction of its merits, drawn from a comparison with other plans ; premising that I shall suppose the more serious cases (which I have already laid down as calling for amputation on the field) have been operated on, or at least marked for operation, when circumstances, as fever, high inflammation, or excessive collapse, may permit ; and repeating, that I am well convinced *the sum of human misery will be most materially lessened by permitting no ambiguous case to be subjected to the trial of preserving the limb* ; constitution, convenience for treatment, and local circumstances, having their full weight in the decision.

A very short time after a compound fracture is inflicted, a re-action, influenced in its violence and the period of its attack by the severity of the case, the original constitution of the patient, or the accidental circumstances of the wound, always takes place. During this re-action, the process of ossification is completely at a stand ; and indeed, throughout the whole cure, the high inflammatory and suppurative actions are incompatible with the formation of bone. The irritability of the muscles is increased in a very great degree, and violent spasmodic contraction of their fibres takes place ; the periosteal tube,



which, in simple fracture, supports, as in a case, and sustains the vitality of every part of the bone to which it adheres, is lacerated to a greater or lesser extent, and in part destroyed ; the invariable effect of which is, extensive inflammation and thickening of that membrane, followed by the death of those pieces of bone, whether detached or not, which are deprived of it. The first stage, therefore, of compound fracture, is one demanding the most rigid antiphlogistic treatment, the most perfect ease and quiet of the patient, and, except in regulating the fever, requiring but little aid from mere surgery, beyond the removal of detached splinters and extraneous bodies. Much, however, may be done by proper management, particularly of the beds. As the irregularities of an ordinary paillasse would obviously injure our patients, one great source of comfort and ease to them, will be, preparing a set of well-stuffed cases of combed straw, wool, chaff, or any other material that may be procured, and placing them on the firmest wooden bedsteads we can get, or on boards and tressels. As it often happens that these cannot be procured, then the paillasses must be placed on the floor, guarded from the damp and cold, if the nature of our hospitals exposes them to such causes, by tarpaulins or water deek ; and occasional irregularities must be corrected by bolsters, cushions, of chaff, hair, wool, &c.



In the inflammatory stage, which lasts from five to fifteen days in general, I am in the habit of leaving the limb in the exact position described by Pott ; but with the bandage of detached pieces of roller, commonly called after Scultetus, reaching for six or eight inches above and below the fracture, instead of the eighteen-tailed one, as possessing several advantages from its simplicity, and the ease with which it is applied, and with which its different parts may be removed, by simply pinning to any of the soiled pieces a fresh slip of roller, and drawing it under the limb into the proper situation, by the same movement which displaces the rejected parts. Over this I place two splints of whalebone, such as are usually supplied to the army, moderately tight, and in such a way as to admit of dressing the orifice, or orifices if the ball has passed through the limb, without removing them. The irregularities of the limb are stuffed with tow, or rags, or bags of chaff, and the whole is kept moist with cold saturnine solution of moderate strength, and with the addition of some camphorated spirit. When the inflammatory symptoms are subdued, I then proceed more accurately to adjust the fractured bone ; and, to this end, place the patient on his back, a change of posture which invariably gives relief, filling up all hollows, and arranging the limb precisely after the mode recommended by Professor

Boyer\*, and applying the bandage of Scultetus afresh, with a roller, moderately tight, on the lower portion of the limb, and proper compresses along the parts. I employ the improved splints of Assalini, if they can possibly be procured; if not, I place two common long splints in the usual way—one from above the hip to the ankle, or from above the knee to the ankle, as the case may be, and the other of proportionate length on the inside—and, fixing the pelvis of the patient by a bandage to the upper part of the bed (if over-lapping of the bones renders such extension necessary), stretch out and retain the limb by means of tape fixed to the bottom, or, what I have found answer still better, by a common tourniquet, the centre of its strap firmly fixed round the knee or ankle, and buckled over the bed post, so that by turning the screw the extension may be moderately made and increased as circumstances demand. This, which was suggested to me by Professor Thomson, at Brussels, I have found very great assistance from, in some obstinate and complicated cases†. In this mixed mode we reap the advantages of both the position of Mr. Pott, and that of Parè and the

\* Boyer *Leçons sur les Maladies des Os*; or the Translation by Farrel.

† If the patient lies on the floor, pickets, or some similar means, must be adopted as fixed points.

more modern French surgeons. The patient is generally extremely tired of his relaxed position before the lowering of the inflammatory symptoms indicate the time for placing him on his back, from which he receives great relief; and we may rest assured that the process of ossification has not commenced until that period; and that, consequently, the application of machinery to extend the limb, or splints and bandage to confine and regulate the new callus, is unnecessary, if not hurtful.

The great error of all the machines for fractures, from Hildanus downwards, is their complication, and their not admitting of the limb being freely dressed without disturbing them; added to which, their price forms a very great barrier to their general introduction.

The management of compound fractures is a most serious duty, requiring industry, judgment, and humanity, as well as great discrimination in both the medical, and surgical, treatment. The position we shall suppose to be established by the means already described; its continuance can be ensured by frequent inspection only (and that should never be seldomer than twice in the twenty-four hours), when all occasional irregularities of posture, or unequal pressure, should be corrected, and all filth (which, from the great discharge, accumulates rapidly) should be removed. Once in the day at least, a compound

fracture should be *regularly* and formally dressed. On those occasions all depositions of matter should be carefully pressed out, splinters felt for and removed, and clean slips of bandage applied, in lieu of those soiled or destroyed by the suppuration. To prevent the soaking of the bedding, a piece of coarse cloth or oiled skin should be placed permanently under the whole limb, and occasionally renewed ; and, to obviate the ill effects of the matter stagnating in the wound, the lightest scraped lint should be laid on it. In some cases I have effectually obviated this stagnation, when the position of the wound did not favour the flow of the matter, by placing a soft sponge over the limb, which absorbed the pus almost as soon as formed, and by drawing a woollen thread through it, and connecting it with a proper dish below, it has performed the part of a syphon. During the employment of these surgical means, the bowels should be kept in a natural state by saline laxatives when required ; and in aiding the patient on those occasions, a very simple addition to our common bed-pans would be most useful ; viz. making the edges opposite the handles conical, as I have seen in the Hanoverian and other foreign hospitals, so as to gradually thrust them under the nates, without forcibly or suddenly displacing the body of the patient. Anodynes are loudly called for in these cases, and are best combined



with antimonials, to obviate their heating and constipating effects. If fever should come on, notwithstanding the most rigorous antiphlogistic diet, the most perfect quiet, and thorough ventilation, the lancet may be had recourse to, but with great caution ; for the period of debility is soon hurried on by the sufferings of the patient and the profuse discharge ; and we must rather trust to leeches and to internal remedies where the slightest ambiguity prevails.

Fresh formation of matter and chains of abscesses often succeed feverish exacerbations, and frequently depend on the presence of splinters. If these sources of irritation can be detected, their removal must be attempted cautiously ; and in all cases when the existence of matter is ascertained, it must be evacuated by direct puncture or counter openings. When all fever has subsided, and the discharge is kept up by debility alone, a light nourishing diet, with a *moderate* allowance of wine, must be permitted ; and in those cases, if no local irritation forbid, pressure made uniformly over the whole limb by adhesive straps and rollers, tends much to prevent the formation of sinuses, and to lessen the purulent discharge. In short, the symptoms in compound fractures assume the most Protean shapes, and can only be met by the most assiduous and unremitting attention, guided by a thorough knowledge of professional principles. Our best en-



deavours, however, will at times fail in conducting our patients to a speedy or even an eventual cure.

In some cases, the disposition to osseous formation is so slow, that, however well the limb is managed, union does not take place for months. In some individuals, no cause can be rationally assigned for this tardy union; in other cases, it can be traced to constitutional causes, and in some, to the existence of extraneous bodies within the wound, either keeping up the irritation or actually interposing between the fractured extremities of the bone, and mechanically preventing their coalition. We are sometimes so lucky as to get at the body thus interposed; but more frequently the rapid sinking of the constitution forces us to amputation. In the case of Captan N——, of the Artillery, who was wounded at Waterloo, the efforts of his surgeon, Mr. O'Beirne, directed as they were by great professional skill, and aided by a most excellent apparatus on Boyer's plan, together with the sound constitution of the patient, and his enjoyment of pure air and every domestic comfort, were baffled for several weeks, without any clue which could lead even to a suspicion of the cause, till a large fragment of shell, nearly an inch in thickness, was luckily discovered and removed from between the fractured ends of the femur; I have found a piece of leather in a

similar situation, and in the course of my examination of several amputated limbs removed from incurable compound fractures, I have discovered, that, notwithstanding every care both in dressing and position, a piece or pieces of bone, including the whole cylinder, not displaced from their position, (and therefore not to be remedied or suspected,) but with the periosteum injured or destroyed, had formed an invincible barrier to the junction of the living extremities of the bone, between which they have been interposed.

When those dead pieces of bone are small and only partially detached, the vessels pour forth that matter which is afterwards, by a peculiar process of Nature, to become osseous; and those pieces are enveloped in the new bony case, and are placed exactly in the same situation as the sequestra in cases of necrosis, from different causes.

We have not the same means in our power to excite the ossific action in compound fractures as in that of the simple kind; irritation of various sorts, pressure, friction, external stimulants to the skin, or even the operation of the seton, as practised by Mr. Rowlands\*, which have been successfully had recourse to in the indolent state of the latter, are inadmissible in the former;

\* Vide Medico-Chirurgical Transactions, vol. ii. p. 47; and vol. v. p. 328.

where, if union is suspended, it is generally from mechanical obstructions, from excessive action, or from disorganization of parts. Original malposition, or subsequent derangement of the bones, are occasional causes of their not uniting. I have lately examined the fore arm of a naval officer, in which the radius was fractured transversely by a musket-ball some years since ; some of the muscles have got between the fractured ends, which are rounded by absorption ; and although, from the ulna still retaining its situation, no distortion of the limb has taken place, a species of gynghimoid articulation, and a partial luxation at the wrist, is formed, which greatly detracts from the power of the limb.

The ravages of disease were most extensive in the cases of compound fractures, which have remained disunited, and which I have examined after the fatal result, or after the limb has been removed. In the soft parts I have met with enormous abscesses extending far and wide around the fracture, so that the ends of the bones have been constantly immersed in the contents ; and the muscles in many cases, and in some, the periosteum separated for several inches from them. The infiltration of matter has extended far in the interstices, and in the fleshy bellies of the muscles themselves, in some cases, dissecting these organs very completely one from the other ; in others, partially destroying them ; and

in numerous instances, leaving no distinction of parts whatever, but a flabby, putrid, offensive mass of decomposed animal matter, the more fluid part of an intolerable foetor, and having thready masses of cellular substance floating in it ; while the more solid have had so little cohesion, that they were easily broken down by the handle of the scalpel, bearing in many instances a most striking resemblance to chewed paper, or the pulp of rags.

The blood-vessels have been observed very often lacerated, and coagula in various stages from recent formation, up to hard consolidated masses, have been found effused from them, separable into different layers, and retaining, even when removed from the diseased parts and washed repeatedly, a very nauseous putrid smell. The bones have not, in some instances which I have examined, participated as much in disease as the soft parts ; nor have the joints in the vicinity of the fracture, appeared to suffer nearly so much as might have been imagined. This exemption has only occurred in two cases ; and in both, in officers of high rank and sound constitutions, who most punctually fulfilled all the directions given to them by me, and were exemplary in their strictness of regimen. One, the Honourable Colonel S———, was an elbow case ; the fracture one inch above the condyle of the os humeri : soft parts nearly gangrenous :



joint filled with puriform matter, without any traces of inflammation of its synovial membrane: bones in close apposition, their ends covered with a very florid spongy flesh, but no appearance of ossification. These appearances were three weeks from the receipt of the wound. The other was an ankle-joint case, Lieutenant-Colonel B———. Two inches from the joint: soft parts beginning to run into gangrene: bones in pretty close apposition; the ends covered with a florid spongy flesh, very easily separable, but without any trace of ossification: joint with some puriform matter, but no traces of inflammation. Dissection six weeks from the receipt of the wound.

In the remainder of about fifty cases that I have examined myself, or been present at the examination of; and thirty examined by gentlemen in whom I place the highest confidence, more or less of disease was observable in the bones, exclusive of the solution of continuity effected in them. The appearances, which were sometimes separate, but much oftener combined, were generally as follows: roughness of the extremities of the fracture; denudation of the sides of the bones, and worm-eaten absorption of them; inflammation and ulceration; exfoliation of various sizes, and of different stages of looseness on the extremities of the fractured ends, but not often including the *whole circle*;



the same on the sides of the bones in the vicinity of the fracture ; the same at a distance from the fracture, but not continuous with it ; line of separation between the bone and its epiphyses or processes, very evidently marked and of a vascular appearance ; (this last appearance I have seen only at the ends of the bone farthest from the source of circulation ; and in such cases, abscesses were formed over the diseased points ;) loss of the cancelli in the medullary cavities of the bones, with destruction of the medulla itself, or conversion of it into an offensive bloody ichor, filling almost the entire canal ; loss of the cancelli, with a bloody fungus, filling the medullary canal like a stopper ; looseness of adhesion of the muscles to the bones, to such an extent as that separation could be effected by the handle of the scalpel or by the finger ; the whole neighbourhood of the fractured bone of a greasy unhealthy appearance ; and, finally, necrosis, or complete death of the bone, with deposition of new osseous matter ; the deposition being irregular, distorting the limb to a great degree, and evidently unhealthy.

Such have been the local appearances on dissection. All this organic injury cannot be supposed to exist without great general disease ; the fever, the cough, the diarrhœa, are all harassing and alarming to the greatest degree ; they sometimes invade separately, and sometimes in

combination, and produce not only all the appearances of pulmonary consumption, but too frequently its fatal termination. If tubercles or a tubercular disposition exists in the lungs, no medical aid will relieve the sufferer; and indeed while the great source of irritation remains, even the temporary alleviation of his misfortunes is looked for in vain. The first approaches of these insidious bowel and pulmonary affections, are much better combated by management and diet than by any medical means. This I am authorized to assume as certain, from having traced them in a vast variety of instances, to errors in these important points; having checked them when forming, by proper restrictions, and having prevented them altogether in cases where they have been naturally looked for from the examples of preceding victims; and these errors have been so very rarely on the side of abstinence, that the exceptions merely tend to confirm the general rule of "strict limitation." That of Wine is one of the most difficult to effect in military hospitals; but it is one that calls most loudly for attention. The idea is *absolutely erroneous*, that a large quantity of this cordial is necessary in the advanced stages of fractures and wounds.

The disposition to Necrosis in gun-shot injuries of the bones, a circumstance of daily occurrence in military hospitals, is always tedious, highly troublesome, and frequently dangerous.

The precise time of its commencement is not easily ascertained ; I have detected it on the twenty-first day from an injury ; but it is more frequently a disease of the advanced periods. It is most frequent in bones covered by their soft parts, while caries takes place more readily when they are exposed to the air ; where the Periosteum is removed for any extent by a gun-shot or lacerated wound, or suffers disorganization afterwards from any cause, whether inflammation, ulceration, or erosion ; or where the medulla is injured or destroyed, it becomes a never failing occasion of the death of that part of the bone in the immediate vicinity of the injury.

This is not the proper place to enter into the inquiry of the power or influence of the periosteum to form bone, as a question of pure theory or physiological research. The fact of bone never being regenerated where it is extensively injured, is beyond all doubt.

There are few military surgeons accustomed to the examination of limbs removed by amputation from causes affecting the bones, who have not found the diseased or fractured part suffering a loss of its healthy colour, and acquiring a sponginess ; or, as the usual phrase is, an honey-comb appearance on its surface ; but to speak more accurately, exhibiting proofs of the action of the absorbents. If an attentive examination

be made of the soft parts surrounding the injured bone, osseous granulations will be frequently observed in various degrees of progress to perfection. In some places they will lie in small irregular masses, hanging by very slender membranous filaments, and easily separable by the finger or probe, or even by simple agitation in water. In others, they will form a continuous surface of some extent and various depths, and will seem like an incomplete sheath or irregular envelope thrown over or around the injured bone, studded as it were on its inside face with hard bony particles ; and often, if the living bone is examined, a corresponding granulated tissue or efflorescence will be observable on it, as if proceeding to meet the former. All these phenomena clearly appear to depend upon the action of the periosteum, whether adhering to the living extremity of the fractured bone, or separated entirely from it ; but still possessing vascularity and life by its connection with the soft parts. The following case, selected from many others, affords a very striking example of this kind :

#### CASE.

A SOLDIER of the 4th regiment of infantry received a wound at the storming of Badajos from a musket slug, which brushed over the course of the femoral artery, nearly about its dipping under the sartorius, and passed through poste-



riorly at the centre of the limb. Both orifices of the wound healed in a very short time; soon after which a hardness and fulness of the part manifested itself, attended with slight pain, supposed to proceed from some pieces of cloth, or other irritating cause, though afterwards, from concomitant circumstances, conjectured to be aneurismal. Shortly after, the man was attacked with the fever of the season, by which he was very much reduced in strength; and, having been a Walcheren subject, little hopes of his recovery were entertained, as a tumour of the spleen had evidently formed. The progress of the tumour of the thigh had been rapid during this febrile attack; and his general health was much impaired. It appeared that the tumour was attended with most excruciating pain on pressure, and particularly at night, even from the weight of the bed-clothes: it spread upwards to within a hand's breadth of the groin, and downwards to the ham. The lower limb was œdematous and almost insensible. It was now obvious that something must be immediately done; and, as little chance appeared by performing any palliative operation, it was determined to remove the limb. The operation was performed on the twenty-first day, by Assistant-Surgeon Scott, then of the 11th regiment, now a resident practitioner in Dublin, without any thing remarkable occurring, except the number



of small blood-vessels to be tied. The limb was carefully dissected by Assistant-Surgeon Edwards of the 43d regiment; the soft parts were flabby, œdematous, and in some spots disorganized; and the great vessels either shrunk or obliterated; but no actual rupture of them could be traced. A large cavity, capable of containing about two pints of fluid, was found deep in the centre of the thigh, involving the course of the slug, and filled with a mixture of gruinous blood and foetid purulent matter. The bone, for the space of about four inches, was found denuded of its periosteum, and rough to the touch. On sponging out the parts, the centre of the cavity appeared occupied by the bone, and its sides were partially composed of a sheath of bony granulations, in some spots nearly of a quarter of an inch thick, firmly adhering to the periosteum (which itself adhered to the mass of muscles), and evidently proceeding from it. The detachment of the membrane from the bone appeared to have been produced by a deep-seated collection of blood, most probably proceeding from sloughing of the coats of the femoral vessels, and slowly exuding into the track of the wound which formed the original cavity. It is likewise probable that the slug, in its passage, had brushed the bone and killed its enveloping membrane; and that, when the space between the bone and injured membrane

(which always separates) became distended with fluid, the sound part of the periosteum was forced up by the pressure on it. Be this, however, as it may ; Nature had made most considerable progress towards the formation of a new bone in the short period of three weeks, solely, as it appeared, by the agency of that membrane. This bony exudation from the periosteum is still oftener apparent where amputation is obliged to be performed a second time, from causes which I shall hereafter mention ; or where, the operation being already performed, the patient falls a victim to the irritation of a diseased bone.

Professor Weidman\* has collected a number of authorities on this point, and particularly relates an instance where Justamond had removed a necrosed bone by gouge and mallet ; but having totally destroyed the periosteum, no bone was ever regenerated afterwards.

The practical inferences to be drawn from this power of the periosteum, are particularly valuable as guides to the boundaries we should ascribe to the extraction of splinters from compound fractures. If the splinter is large and adherent at many points, and particularly if it

\* The Professor's excellent Latin Treatise on Necrosis is exceeding scarce ; but a good translation has been published at Paris in 1808, by M. Jourda, 1 vol. 8vo. An English translation may shortly be expected by my late assistant, Dr. Knox.

is longitudinal, it will be worse than useless to attempt its removal by force. I have seen several instances in which fever, intense pain, and even death, have followed such a wanton interference with the operations of Nature. If the periosteum is not irrecoverably damaged, partial or even entirely new formation may take place, and the separate portion of bone will re-unite ; if it is, Nature will herself point out the necessity for removal, by the gradual loosening of the parts, ascertainable by the finger or probe.

The two following cases bear strongly on this point ; and the latter serves to illustrate some of the observations made on the extraction of balls.

#### CASE.

A FRENCH PRISONER of war had been wounded by a musket-ball in the left leg. It fractured the tibia about two and a half or three inches above the ankle-joint. The fracture extended longitudinally, and as several loose pieces of bone were ascertained to exist, it was proposed to extract them by an incision, as they seemed the only obstacle to the completion of the cure and final recovery of the limb. An extensive incision was made ; but nearly all the loose pieces adhered by one or more points, and could not be brought away by any reasonable force. The

wound was therefore allowed to heal up, and Nature to resume her own operations, till towards the latter end of the third month from the infliction of the wound, the largest splinter and the only one then remaining loose, actually protruded of itself, and was easily extracted by the common dressing forceps. The wound almost immediately healed, and the patient was sent to his own country.

#### CASE.

A FRENCH PRISONER was brought into Brussels soon after the battle of Waterloo severely wounded in action with the Prussians; he received after he fell several bayonet and sabre thrusts, and one lance wound through the chest; but the most serious injury was a compound fracture of the right thigh from gun-shot. Three musket-balls had struck nearly at the same time on the outer side of the limb, splintering the os femoris from the middle of the upper third of the bone to within two inches of the condyles. The discharge, as might be expected, was enormous; but his appetite fortunately remaining good, he was enabled to support a waste of fluids scarcely to be credited. Whilst under cure, many extensive incisions were made to extract bones and balls; but with most extraordinary want of success. After the failure of these incisions, one



of the balls spontaneously presented at the orifice, and another came away in a cataplasim. Although a recurrence to more ample incisions was pronounced the only chance for the poor fellow's recovery, no further operation was attempted ; but by minute attention to dressings, supporting his strength, and, above all, moving him to another hospital which enjoyed a purer air, the fracture consolidated, a very few minute splinters were easily removed by the dressing forceps, and the man recovered.

In some instances, though more rarely, no apparent exfoliation whatever takes place, notwithstanding that the bone is considerably shattered and exposed to the air, a cause which so frequently occasions its death and separation. Nothing but the youth and sound constitution of the patient, which admits of the recovery of the injured membrane, and the cleaning of the ulceration of the bone, can account for this. The more minute scales or comminuted portions are carried off by the flow of purulent matter, either totally unobserved, or in small palpable particles.

Deep incisions will, indeed, often produce exfoliations, but they are then the consequence of the unnecessary injuries inflicted by the surgeon, and not the result of nature's efforts at regeneration. I might produce a great mass of evidence illustrative of the propriety of patiently waiting the event, and not hurrying into operations under the false idea that exfoliation must necessarily follow



every injury inflicted on a bone. I have often seen extensive and most painful incisions made down to the bone, and in the whole course of a limb that has been fractured, for the proposed purposes of admitting of the free removal of fragments, and I am convinced I have often traced the eventual loss of the limb to such causes. I would not by any means be supposed to insinuate, that incisions are not called for and highly proper in many instances, particularly where a free discharge is not afforded for purulent matter, or loose spiculæ lying within a confined cavity; but I would wish to impress on the younger surgeon the propriety of sparing his incisions until he has some *determinate object in view*, and while in quest of dead bone or deep-seated abscess, not to lay the foundation for both by his own ill-judged attempts at detecting them.

The natural efforts at exfoliation commence at different periods, and its progress is rapid in proportion to the smaller or greater solidity of the bone, or the state of the periosteum; the separation of the scale or piece being always more rapid in proportion as it is more or less deprived of that vitally important membrane.

A method for the excitement of exfoliation in carious cases, or the removal of the sequestra of bones in a state of necrosis, has been long a desideratum among surgeons, and has produced several contradictory and some ludicrous remedies. Rasping, burning, boring, and cutting, have all

had their advocates, and oiling, drying, and immersing the bone in strong pickle, or even in aqua fortis, have been considered useful by others. Some place their faith in the application externally of euphorbium and burning oils; others rely on internal medicine; and one gentleman assures us, "that without administering asafœtida in this manner, there is no hope for the patient."\*

I have long laid aside all topical applications to bones about to exfoliate, the common simple dressings excepted, and with a due attention to cleanliness of the parts, and to the state of the stomach, bowels, and skin; with gentle excitement by a probe or forceps, and a prudent and regulated use of the knife or prepared sponge, although the cure may be tedious, I have generally found it complete.

In cases where the separated pieces lie loose, and cannot easily be got at by the forceps, setons have been employed with some advantage, for the purpose of bringing them away; and when judiciously applied, and not carried to such a length as to affect sound pieces of bone with caries, and thus produce what they were meant to remove, they may often be usefully had recourse to. Staff Surgeon Boggie showed me some cases at Brussels in which he had employed the seton with success, and there is published in the 7th volume of the

\* *Vide* Weidman, traduit par Jourda, and the authorities quoted by him, p. 115, *et sequent.* Monro in Medical Essays of Edinburgh, Vol. V. Article 24.

Medico-Chirurgical Transactions an account of a case in which he adopted the plan. Doctor Arthur, Surgeon to the Forces, has also successfully used them in some old cases at the General Hospital of Chatham. But to the indiscriminate introduction of setons in gunshot injuries, either of the bones or soft parts, I cannot help entertaining strong objections ; they are at best but a clumsy and unmanageable substitute for the knife, and in numerous instances much more painful and irritating.

In limbs with a diseased bone, the state of the soft parts depends, in a great measure, on that of the bone. The exfoliations, or the protrusions of sequestra, are generally announced by an alteration in the appearances of the part, as well as in the quality of the discharge, and to attempt any permanent improvement in either is perfectly hopeless, until the state of the living bone is ameliorated ; but much temporary advantage may be derived from external applications and the proper use of pressure and bandages, with the occasional employment of the knife. Cloths immersed in vinegar and cold water, or in moderately strong saturnine lotions, may be placed around the limb if much inflammation is present ; and solutions of the sulphate of copper applied to the sores will be found very useful to correct the fœtor of the discharge, and stimulate the vessels to a more healthy action. Aluminous solutions are also of considerable utility in correcting the fœtor, and a diluted

nitric acid will often be advantageously employed in very sluggish cases with a luxuriant fungus, or a sloughy disposition. Very little, however, is to be expected from any of these remedies, if the general health is not supported, and the most rigid cleanliness and ventilation observed in the wards where such cases are treated.

Where the patient can move about, exfoliations are often remarkably promoted by moderate exercise of the affected limb. While using the very simple machinery of Hilsea Hospital, hereafter to be described, I was much struck by this circumstance. A great deal is no doubt to be attributed to the improved health, which admits of, and is connected with exercise, and respiring a pure air out of the wards of an hospital ; but I conceive much is also to be referred to the mechanical action of the muscular fibres upon those points of bone into which they are inserted, and which, if loosened from the main mass by disease, must certainly be considerably influenced by a steady and protracted natural force acting upon them, without the aid of surgical instruments, or the violence of operations.

Where, however, a perfect necrosis has taken place, and the dead bone is invested with a living covering, respectable as the authority of Weidman is, for leaving almost all to nature, I must, from my own experience in military practice, strongly recommend having recourse to the more active



measures usual among British surgeons to save a life at least, if we cannot save a soldier to the country. In determining the proper period, it is always to be kept in view, that the new envelope is much more dense when fairly formed than the original bone ; it is entirely destitute of cancelli, and the earlier the opening of it is made, the easier will it be to the operator, and the patient will be saved much misery and irritation. It should also be recollected, that in fractured bones, when union has taken place, the medullary canal is obliterated at that part, and filled up by the new callus, which is not absorbed for a length of time. Hence, partially perforating the shaft of the bone in search of sequestra is often useless. The septum formed across the cavity will render a perforation necessary, above and below the union, should sequestra exist in both the upper and lower division.

I shall now advert to a species of the comminuted compound gunshot fracture, which, although at first of but little consequence in appearance, is of most serious importance in its results. This occurs where a musket ball has perforated a cylindrical bone, without totally destroying its continuity, and, consequently, without producing any distortion of the limb, or other symptoms which characterize a fracture. The foundation of infinite mischief is, however, laid, for not only is the shaft of the bone injured, but fragments are carried into, and lodged in the medullary canal ; and if the



limb has been in an oblique position, or that the ball has taken an oblique course, these fragments are often driven in to a great distance, and firmly impacted in its cavity, there keeping up a constant and uncontrollable irritation, and destroying both the medulla and its membrane, together with the cancelli, which naturally support it. I have repeatedly seen this separated portion of bone, lying in the medullary canal, at the distance of from four lines to an inch and half from the circular hole formed by the passage of the ball, retaining its shape and its solidity, while all the surrounding osseous parts were diseased, and formed a spongy discoloured mass of bony granulations around it; the periosteum for some way, both above and below the wound, being entirely separated from the bone. To attempt to save such a limb, is imposing a task on the powers of nature, which nineteen times in twenty she is unable to effect, even under the most favourable circumstances. If a ball has passed through without carrying in any fragments of bone, a case which sometimes happens in the thigh, when the man is standing erect, and the ball has struck the bone fairly and directly, the case is more favourable than when the wound is oblique, as in the arm, which is so often thrown into a variety of postures; and, consequently, where there is a greater chance that the channel of the ball should be formed obliquely, and the spicular fragments forced up into the medullary cavity.

But even of this favourable variety I have seen only two cases cured, both of persons struck on the centre of the femur, the wound admitting a finger to be passed into the bony ring, or perforation, and there to find a clear, unembarrassed and simple loss of parts. By far the most frequent result is the loss of the limb sooner or later, after a very tedious and distressing train of symptoms, wearying to the patient, and baffling every endeavour of his attendants. On examination, we find bony fragments lying beyond the reach of operation, either in a parallel direction in the cavity of the bone, or fairly wedged across it, the medulla destroyed, the cancelli absorbed, and, if the posture of the limb admits of it, the fragments falling down deeper into the canal, as the bony network is removed. To obviate these mechanical injuries, nature makes many inefficient efforts, and throws out large shapeless bony masses, which either envelope the diseased parts completely, or else so embarrass and partially fill up the orifices of the wound in the bone, as to render the extraction of fragments, or even their detection, next to impossible. The attempts of nature to remedy this state are often continued so far as to form orifices, or Cloacæ, in this newly formed bone, for the discharge of the fragments. In some cases, the parts of the original bone which formed the sides of the ring, and kept the limb in its natural position, and at its due extent, are entirely absorbed ; little or nothing

but the new and loose osseous sponge remains, and the muscular power being constantly exerted on it, a shortening and thickening of the limb succeeds.

I shall, in further explanation of this important point, offer a very interesting case, with which I have been favoured by my friend Doctor Denmark, Physician to the Fleet, and late of Haslar Hospital.

#### CASE.

JAMES WOOD, a marine, belonging to his Majesty's ship *Ajax*, ætatis 25, was admitted into Haslar Hospital, 27th September 1811, for a gunshot wound through the right thigh, the ball passing from before backwards, about five inches above the patella. I saw him nearly a year previous to this, (on the day succeeding to the injury,) and recommended the able surgeon under whose care he was, on board the *Ajax*, to attempt the preservation of the limb. Neither the joint, nor any important blood-vessel being implicated, justified, in my opinion, the trial, although it was sufficiently apparent, that the ball had passed directly through the diameter of the bone.

On my appointment to Haslar Hospital, in May 1812, I there found him a patient, deriving all the advantages which hospital treatment and professional talents could afford, during this long period, without being one whit nearer recovery.

The lower half of the thigh was now much enlarged, visibly shortened, the muscles having nearly lost all power over the flexion and extension of the knee-joint, and the constitutional health materially injured.

The occasional favourable but deceptive appearances of the wound, together with the patient's youth, constitution, and entreaties to defer the operation, were the chief causes of procrastination. The discharge would, at times, become greatly diminished; the healing process would, for a while, seem to go on rapidly, with the absence of pain, and subsidence of inflammation, when, all at once, these last would again recur, with the formation of deep-seated abscesses, bursting out of matter, and high symptomatic fever. Such harassing alternations induced him at length to coincide in the impropriety of further delay towards the removal of the limb. It was, accordingly, performed on the 7th September 1812, nearly two years subsequent to the infliction of the injury.

The soft parts, down to the bone, integuments, cellular substance, muscles, and periosteum, were all much thickened from the interposition of consolidated lymph, consequent upon long preceding inflammation. The periosteum was extensively diseased, thickened, and highly vascular round the wounds, to a considerable distance. The apertures in the bone were nearly blocked up with an adhering gelatinous substance, separable only by macera-



tion, which, no doubt, (by its closing from time to time round the detached bone, so as to confine the discharge,) contributed to the above phenomena of favourable appearances, succeeded by pain, inflammation, burstings of matter, &c. This man was soon discharged cured, having recovered quickly after the operation.

It very often happens, after gunshot injuries of the bones, that the limb feels and looks more like a plaster cast, than a living organized part, from the quantity of irregular osseous matter thrown out. This matter sometimes involves the neighbouring joints, and occasions incurable ankylosis, which is a still more certain consequence if the surfaces of both bones are injured, in which case, each contributes its proportion of osseous granulations, in which the sound portions of bone become imbedded. The removal of the limb is in these cases frequently our only remedy.

In some cases, this osseous deposit is not confined to the immediate vicinity of the injured bones. I have in my possession some specimens, where an irregular osseous fungus has sprouted out, as it were, from the sound shaft of the bone, one or two inches from the mass of disease, and completely detached; this operation has taken place in some instances at several distant points at the same time, and all the fungi have become successively involved in the advancing and increasing deposit.

In some cases, these osseous exudations appear



on the ridges of bones, sticking out from them in the form of spiculæ, and giving the bone a serrated appearance ; in others, the surface of the bone is covered with new formed osseous matter, divided into numerous sulci parallel to each other, and with processes of the periosteum dipping in between them, in a manner very nearly resembling the surface of the stones of some fruits ; but in the ordinary process of the formation of a new bony sheath from necrosis, the surface is more uniform, with irregular minute holes into which these processes sink. In the recent bone, these irregularities are all concealed by the investing thickened periosteum, which, by its affording an uniformity of covering, often gives rise to a deception, in some cases so complete, as to lead to the supposition, that the heads of the bones participated in the renovation of their shafts. This is never the case ; the process of renovation in necrosis goes on only in those parts of bones corresponding with their medullary cavities, and the apparent renovation is shown to be illusive on the removal of the periosteum by careful maceration. If the removal is attempted by the unassisted knife, the effect is very incomplete, the membrane is glistening in appearance, and in consistence somewhat like cartilage, and only loosens by long maceration, when it peels off in a tough leathery coat, connected to the subjacent bone by vascular threads ; and on its removal, a smooth narrow ivory-like line is

found to connect the new formation to the original epiphysis, while the old bony shaft is in various stages of decay. If the necrosed part be examined, while nature is in full work, that part of the new bone most recently deposited, can always be very readily known by a beautiful distinctive mark ; the external periosteal covering is thickened, red to the eye, and when peeled off, the subjacent parts, before they are clean washed, give exactly the appearance of a piece of parboiled pork, from which the rind has been torn ; the surface of the bony crust is covered with dots where last deposited, while, when of older date, it is covered with sulci, formed apparently from several dots being united in parallel lines, by the absorption of the solid interstitial spaces, which at first existed between them.

It sometimes happens, that the head or neck of a bone is perforated, or grooved by a ball, and that no very severe symptoms call for the amputation of the limb immediately, but the effects of the injury are propagated to various distances, from the point of its infliction, to the very extremity of the affected bone. In Mr Vance's collection, there is a most remarkable instance of this ; the whole surface of the head of the humerus is rough and diseased ; immediately at the neck necrosis has taken place, and has spread over the entire shaft ; and at the condyles, it becomes again diseased like the head, but without the smallest appearance of the regeneration of bone. This is very illustrative of some valuable pathological facts, and naturally suggests a practical cau-

tion. It shows that necrosis may exist in one part of a bone, and caries in another ; it confirms the opinion, that the shafts of bones only, and not their extremities, are regenerated ; and it affords an unanswerable proof of the propriety of waiting for the termination of the efforts of nature, or at least a demonstration of where they will terminate, before performing the excision of the head of the humerus ; an operation which, upon the whole, I apprehend, is more imposing in the closet, than it will be found generally useful in the field.

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### OF INJURIES OF THE JOINTS.

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SERIOUS as the consequences in general are when a joint has been injured by the passage of a musket ball near or through it, there are highly favourable cases, in which the limb may be saved.

Where shells or grape brush or graze along the joint, and even partially open it, as sometimes happens, there is also a *possibility* of saving the limb ; but in all those cases, however anxious we may be to do so, we should never allow our hopes or our wishes to deceive us ; we know not the moment that inflammation may set in and mar our most sanguine prospects ; and it is but justice to ourselves, and our patients, to explain to them or their friends the probable failure of all our endeavours.

\* Mr Hunter gives us the case of a man, C. D. who was shot through the joint of the knee; the ball entered at the outer edge of the patella, crossed through the joint under that bone, and came out through the inner condyle of the os femoris. This man, and four others, had nothing done to their wounds for four days after receiving them, having secreted themselves in a farm-house, and when brought to the hospital, the wounds were only dressed superficially, and they all got well. Had this man been placed in a waggon or on horse-back, and carried for some miles to an hospital, with his usual allowance of food, would the result have been the same? I confidently answer, No. Nothing but quiet and abstinence could have produced such an exemption from inflammation; and even with those circumstances in his favour, the case is one of a thousand. In my own practice, I have met with only two cases where the limb was saved after a serious injury of the knee-joint, † and in one of them only was the perfect use of it restored. I never met with an instance where the ankle or elbow-joint was perfectly restored after severe injury, though some where the limb has

\* Treatise on the Blood, Inflammation, and Gunshot Wounds, London, 1812, Vol. II. p. 438.

† The head of the fibula is in some favourable cases the part alone injured, and it has in some of those instances been removed without any further operation, and, of course, without implicating the joint *directly*; even this, however, is by no means a frequent occurrence.



been saved. Of the shoulder-joint the recoveries are more frequent than in either of the other cases, in consequence of its less complicated structure.

The more general results are pointed out in the following cases, furnished me by Assistant Surgeon Simpson, 36th regiment.

#### CASE.

A SOLDIER, at the action of the Nivelle, received a musket shot in the knee-joint. The joint was thoroughly perforated near its centre; the temporary dressings usually employed on such occasions were applied. When the heights were crowned by our soldiers, and the enemy dislodged from their last position, our wounded were conveyed into the huts previously occupied by the French troops. On a more minute examination of the different casualties of the day, no case appeared to demand more attention than the one I have mentioned. It was already late in the afternoon; the wound, in its original state sufficiently severe, had now assumed an appearance infinitely more alarming; inflammation had set in all round the joint, and threatened to proceed with extreme rapidity and violence; the pain was excruciating and incessant, and the screams and groans the patient uttered indicated the most agonizing bodily torture. It was necessary that something should be done for his relief, and that too without loss of time. With a single exception, every voice, and the patient's



among the number, decided in favour of immediate amputation. That exception, in spite of all his earnest entreaties to the contrary, sealed the fate of the unfortunate sufferer ; the attempt to save the limb was to be made. That same evening we marched after the enemy, and I never saw him more. From some of his comrades, who soon after joined the regiment, I learned the termination of the case. He had experienced no relief from pain ; the inflammation had extended all over the limb ; and, worn out by suffering, and the acuteness of bodily anguish, on the 4th day he had expired.

#### CASE.

A SOLDIER, seated on a sloping piece of ground, with his knees bent, and his legs drawn close to the thighs, was wounded by a chance shot from the rear. The ball entered the thigh, fractured the femur near its lower extremity, passed close behind the knee-joint, and came out again near the head of the fibula, after injuring that bone. Here again, in defiance of every risk from the complicated nature of the wound, and the threatening symptoms which speedily shewed themselves, *the limb saving system* was adopted. The inflammation in the injured parts, as well as the general excitement, ran high, and the life of the patient was in the most imminent danger. His sufferings from the extensi      of the limb were most acute ; the

abatement of the first violent inflammatory stage produced but little relief from suffering; the swelling continued almost as great as ever; the discharge of pus alarmingly profuse and debilitating; the knee became implicated in the general mischief; extensive abscesses and sinuses formed in the thigh, and around the joint; and, after a lapse of about six weeks, which had been productive of nothing but ruin to the constitution of the patient, and sensations of the most painful regret in the minds of the medical attendants, a moment favourable for the performance of amputation was taken advantage of—it was too late.

The following case is illustrative of the practice to be pursued in injuries of the joints, and, as it is particularly interesting, from being related in the words of the patient himself, Lieutenant-Colonel R. ——— Dragoons, and remarkable for the rigour of the practice, and the cheerfulness with which it was submitted to, I shall make no apology for inserting it here.

#### CASE.

“OWING to circumstances of the service on the 16th June 1815, I had a common tea breakfast, and at night, after a fifty mile march, a piece of bread, with a little spirits and beer. On the 17th, I had a meat breakfast, and, throughout the day, was employed in a very severe skirmish in heavy rain. At night I took a small piece of bread, and a little

spirits. On the 18th, I took for breakfast, at seven o'clock in the morning, a very small quantity of meat, and one glass of wine.

“ *Sunday, 18th June, Waterloo.*—About two o'clock, I received a musket-shot in the outside part of the right knee-joint; a surgeon, who saw it almost immediately, was prevented cutting out what was then thought to be the ball, protruding on the opposite side of the knee-pan, by the heavy fire of the enemy. I moved back towards the village of Waterloo, and on the road met with another surgeon, who looked at my wound, and it was decided that amputation above the joint was the only means of saving my life. The instruments were brought for the purpose, when a reiterated attack by the enemy's cuirassiers caused orders to be issued for our immediate removal. I moved on to Brussels, where I arrived at half past eight p. m. I had my limb washed, was stripped and put to bed. No dressing or application whatever was used, but I received a caution from a medical gentleman, who accidentally saw me, to take only lemonade; my diet, therefore, this day was water and lemonade.

“ *Monday 19th.*—I was recommended to send for Mr Hennen, the principal medical officer of the Jesuits' Hospital, who was entrusted with the general charge of the wounded officers and staff. I was taught to place the most perfect confidence in him, and I accordingly wrote to him. My

diet this day was entirely confined to lemonade. *Tuesday 20th.*—Mr Hennen did not come till towards evening, and then placed me on his own private list of patients. Before his arrival, the assistant-surgeon of my own corps brought a staff-surgeon to remove the limb; but the latter gentleman, after carefully examining it, said he did not feel justified in amputating it without a consultation. Mr H. ordered me immediately to lose sixteen ounces of blood from the arm, to apply twenty-four leeches to the knee, and to purge copiously with Epsom salts, keeping the part covered with cloths dipped in cold water, and preventing inflammation by all possible means. His directions were complied with, and I felt relieved, but much debilitated; diet, water and lemonade. *Wednesday 21st.*—The assistant-surgeon called in the morning, and applied fifteen leeches; Mr Hennen called in the evening, and ordered thirty to be applied instantly by a native surgeon, which was done effectually, and reiterated his direction to live low, and keep down inflammation by all possible means. I now felt very languid, and, in addition to my water and lemonade, took one basin of gruel and one small roll (weight two ounces) of very fine white flour. *Thursday, 22d June.*—Bled again with thirty leeches in the morning, and thirty in the evening; some of the orifices continuing to discharge from one bleeding to the other. Diet as yesterday, with tea to my roll. *Friday 23d.*—



Sixty leeches applied this day, and the cold application continued as usual night and day. Breakfast, tea and half a roll; dinner, a very little vegetable and half a roll; supper, gruel and a roll.

Mr Hennen made a very cautious opening on the spot where I fancied the ball was; he found a large portion of bone, but did not extract it. This whole day I had much pain and some fever. *Saturday 24th.*—The same treatment continued, but I had only thirty leeches; in the morning fever less; pulse very low, hard, and wiry; diet as yesterday. During the whole morning I felt very cold, and changed my bed linen, as every thing was wet about me. In the evening Mr H. came. The cold I had complained of had become excessive; I was much shook by it, and felt wretchedly. He ordered an immediate change of application to hot fomentation continued for two hours at a time; and after that a large warm poultice to the knee. The hot fomentation increased my pulse so much, that after midnight it was more than 100 per minute. I perspired, however, and my breathing was free; and though the pulsation in my head was violent, I had no pain or other symptom of fever. The pain in the knee was much lessened, and from that period gradually diminished. *Sunday, 25th June.*—Mr H. and the assistant saw me in the morning; all going on well, and all alarm removed. Ordered to strengthen my diet; breakfast, gruel and one roll; dinner, vegetable



soup, (no meat,) one roll, coffee ; supper, gruel and one roll. *Wednesday, 28th June.*—The two last nights have had slight night sweats ; again ordered to strengthen my diet. A healthy discharge now came from the wound ; some small pieces of bone had been removed ; eleven leeches were applied on Monday evening ; diet—breakfast, gruel, one roll ; basin of veal soup and one roll at eleven o'clock ; dinner ; peas soup and one roll ; evening ; basin of veal soup and one roll ; supper ; gruel and one roll. *Thursday, 29th June.*—There had been a swelling and pain on the inside of the knee, and above the joint where I fancied the ball had lodged. This morning, on removing the poultice, a considerable aqueous and bloody discharge was found on it. The swelling was reduced, and the pain diminished. The veal soup, added to my vegetable diet, had the desired effect, and I had no more night sweats.

“ *Friday 30th.*—Discharge less and of better quality ; ordered to take a little meat and a glass of wine. Diet as on the 28th, with the addition of one ounce of solid meat, and one ounce of claret. *Saturday, 1st July.*—A healthy discharge, and doing well : about the 5th or 6th July, cold goulard was applied to the part, which removed a heat of the skin caused by the poultices and fomentation. Diet was now gradually increased to about three ounces of meat, and two ounces of claret. I have gradually and rapidly improved in bodily strength,

and the knee goes on as well as possible. The wound is closed up, and seems quite sound: *July 26th, 1816.*"

In this case the ball, whose course was never accurately ascertained, was supposed to have lodged in the vicinity of the joint. When I saw the Colonel, inflammation was about to set in, and there was considerable tumefaction of the whole limb; one orifice only appeared, and that much swollen and nearly closed in consequence. On the 6th day I felt a moveable substance on the inner side of the patella, which I imagined might be the ball; I cautiously scratched, bit on discovering that it was a portion of the patella itself fractured, but so closely connected with the original bone, that to remove it would be in effect to open the knee-joint, I replaced the skin which I had drawn over in the same mode as if I had been cutting for a loose cartilaginous body in the joint itself, and it adhered in a very short time. On the evening of the 7th day, some slight rigors, and the appearance of the knee, indicated the formation of matter, which occasioned the change of application. The very rigorous treatment employed during the inflammatory stage limited this formation considerably; on the 8th day, a threatening of inflammation induced Assistant-surgeon Prosser, who paid most unremitting attention to his Colonel, to apply some more leeches, which effectually stopped its progress. During the whole period, from the inflic-

tion of the wound to the change of external application on the 7th day, which includes the period of inflammation, the quantity of blood lost, including the *general* bleeding which preceded the application of the leeches, (which I would recommend always to be had recourse to, and in a very full stream,) amounted, by calculation, which I consider to be much within the mark, to 235 ounces. I think it more probable that the amount was 250, because, even in England, about one ounce per leech is the estimated quantity lost, and it must be admitted that the foreign surgeons are generally more expert in their management of these animals than we are. The oozing between the bleedings was also very great, and one day particularly, even active. The quantity of food taken during those seven days, or rather during the last four, was so small, that in comparison Valsalva's diet was excess ;\* but to this certainly much of the preservation of the limb was

\* The rigid mode employed by Valsalva for the cure of aneurisms is detailed by Morgagni, Letter 17, Article 30, and is as follows :—The patient, after losing as much blood as was deemed necessary, was confined to bed, from the commencement of the cure until its completion, restricted to a most abstinent diet, gradually diminished in quantity till he could scarcely move himself. The solid food was diminished so low as to half a pound of pudding in the morning, and half that quantity in the evening. The drink water only, and that within a certain weight, which he medicated with what he called ice of quinces, or the lapis osteocolla, ground down into a very fine powder. The return to a more nutritive diet was equally slow.

due. Much also must be attributed to the previous exhaustion from want of food, and from fatigue, as well as to the powers of a sound constitution, and a cheerful mind.

In all cases where we may be induced to attempt the preservation of a joint, the extent of the wound, its vicinity to the large vessels or nerves, the comparative injury done to the bones forming the articulation, the constitution, habits, and mode of life of the patient, the possibility of enjoying rest and quiet, the nature of the accommodation to be procured for him, and the facilities afforded to his medical attendants of seeing him and enforcing their orders, must all be maturely weighed. Scrofula and habitual drunkenness are almost insuperable bars to effecting a cure under any circumstances.

On examining the joints of limbs removed after gunshot injury, it is curious to find to what an extent disorganization may have proceeded, while, in some cases, the severe constitutional effects are not at all accounted for by the lesions apparent on dissection. Many of the phenomena presented by joints affected with White Swelling, are to be observed in some of the more protracted cases of gunshot injuries, and particularly a great diminution of their specific gravity; but in those where the removal of the limb is earlier had recourse to, the effects of high degrees of inflammation, absorption of the cartilages, thickening of the synovial mem-



brane, effusion into the joint itself, and into the bursæ in its neighbourhood, are the derangements principally to be observed, the connections or organization of the bones and surrounding muscles not being affected in these early stages. \*

Balls often pass through or along the bones of the hand or foot, and, except in very severe cases attended with great loss of substance, amputation of the member is not immediately necessary. The strength of the fasciæ covering those parts, and the number of minute bones composing them, will, however, render extensive openings peculiarly requisite. These bones never suffer from necrosis, nor do they ever become regenerated, as far as my experience goes ; but if the aid of an appropriate supporting splint, assisted by proper bandages, is had recourse to, their loss is soon supplied by a new formation of soft parts, approaching to a cartilaginous nature ; and by the approximation of the sound bones to each other. However desirable it may be to save a hand or foot, yet, in severe lacerations, the frequency of tetanic affections should at once lead us to adopt immediate amputation.

The injuries occasioned by balls lodging near or about the joint of the hip, are among the most

\* I have met one case where, I am confident, had the ball been looked for in time, the limb might have been saved. It lay for three weeks under the ligament of the patella, until at last all distinction of parts was confounded in wide spreading inflammation.



serious of military surgery. The fever, the profuse discharges, the tedious exfoliations, all tend to sink the patient, and are but too often fatal. In some of these cases, the course of the ball is so obscure, and its place of lodgment so uncertain, that it can only be detected in death. In the last case of this kind which I examined, we found the ball lodged deep in the great trochanter; but as the patient lay in bed, its entrance was so completely covered by the tendon of the obturator externus, as to preclude the possibility of detection. It is possible, if the surgeon is early called in, and can at once decide on the nature of the case, that the application of the crown of a trephine, aided by strong forceps, may enable him to remove the ball if thus lodged; but in general the encouragement to attempt such an operation is but slender, and little hope remains but from the performance of amputation at the joint,—a truly awful alternative.

It sometimes happens that partial fractures of the neck of the femur take place from gunshot injuries, which for a long time escape detection; other injuries also of the joint have their foundation laid on the infliction of the wound, and only develop themselves in the progress of its treatment, when little or nothing can be done for them. Of this kind I have been furnished by Staff Surgeon Hughes with the following interesting case of spontaneous luxation :—

## CASE.

ON the evening of the 22d July 1812, a mounted officer, of a highly scrofulous habit, was wounded by a musket ball, which entered about the centre of the dorsum of the ilium, and seemed to have passed obliquely downwards among the glutæi muscles, towards the great trochanter ; its course, however, could not be traced farther than about two inches, and it could not be felt. He suffered but little inconvenience that night, and the third morning after I found him in good health and spirits, and free from pain in the wound, which was without inflammation. After some days confinement to bed, he was suffered to get up, and walked to a sofa placed at a window of his room, where he passed the day, and this he repeated for about seven or eight days, when he was moved to another more commodious quarter. About the 15th of August he was seized with excruciating pain in the groin and hip, so much so, as to excite violent screaming on the apprehension of being moved or even touched, although the wound itself and all the surrounding parts seemed perfectly free from inflammation, nor did he labour under any constitutional febrile irritation. The discharge from the wound was thin, and in small quantity.

In this state he continued with occasional temporary mitigation of his sufferings until September, when he became easier, and on the 16th of that

month the wound was healed, and there appeared no difference between the wounded and the sound extremity. This ease, however, was of short duration, and the wound having again opened, and the discharge become synovial, a retraction of the thigh to the extent of more than three inches was found to have taken place between the dressings. His sufferings became dreadful, and, to add to them, he was seized with dysentery. Under this accumulation of misery, he was obliged to be removed in November from Salamanca to Almeida, and from thence to Oporto. There I saw him in March 1813; the wound healed, and his health perfectly restored, but the limb permanently shortened, and the toes turned outward. I saw him again in April 1816. The head of the femur had formed a cavity for itself on the dorsum of the ilium, and he enjoyed a considerable motion of the thigh.

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### CONTRACTED EXTREMITIES.

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IN all the injuries of the bones and joints, and in many others which only affect the muscles of the limb, contractions of various degrees take place. These may originate either in a loss of parts, whether in the bones or the muscles which move them, or in a rigidity of the joints from the effects of in-

flammation, or from improper posture, generally the bent one ; or a combination of all those causes may exist.

To remedy these contractions, a variety of mechanical contrivances have been had recourse to ; but I am persuaded, that the more simple the plan, the more likely it is to succeed. That in use in Hilsea Hospital is, perhaps, the most simple of any, and can be easily, and without expence, erected in every hospital. It consists of a firm wooden chair, with a strong jugum of wood, of the shape of the letter U, for confining the thigh, if the contraction is in the knee-joint ; or a piece of wood with a hinge, like the letter V, if the elbow be the joint affected ; some small brass pulleys made for screwing in the floor, wall, or ceiling, with a proper cord ; a shoe with three loops of iron, one at the toe, and one at each side, halfway between the toe and heel, and a tin or other vessel for containing some weights. The inventor of this very simple machine I do not know, but of its utility, under Staff Surgeon Coates, and Doctor Knox, I have had several most convincing proofs.

The mode of using it for a contracted knee is as follows : The patient being seated on the chair, the jugum, properly cushioned, is fixed over the thigh, so as to prevent it from rising, and the shoe being put on, and steadied by cords and hooks applied to the external iron loops, and fastened to the wall, a cord of whatever length may be judged pro-

per, previously brought through one or more pulleys, and, with a hook attached to the end of it, is fastened to the loop in the toe of the shoe; at its other end is the scale or vessel for holding the weight. Now, it is evident, that, on putting a weight into the vessel at one end of the cord, the other must be acted upon; and if the weights are properly graduated, force to any degree, from the most gentle, can be made use of. In the same way, the arm being secured in the hinged jugum by straps to a proper table, the cord hooked in the jugum, and first passed through a pulley in the floor, and then through one in the ceiling, as in the other case, will have the effect of gradually stretching it. The advantage gained by each trial can be measured by a common ruler. Simple or medicated frictions, or the affusion of cold or tepid water, may be employed during the time of using the pulley, and the limb may be subjected to it as often during the day as may be thought necessary. Morning and evening are the usual periods at Hildsea, and hitherto there have been no states of contraction, except those depending on ankylosis, which have not derived benefit from it.

By a judicious application of bandages, and a strict attention to posture, in the early stages of wounds, these accidents may in most cases be prevented; and in all, their future ill effects considerably lessened; but it is a matter of serious importance that a surgeon, unacquainted with military



practice, should be put upon his guard against their voluntary occurrence, the frequency of which in the army has no parallel in the records of civil hospitals. The judgment and discretion of the surgeon will point out to him the means to be adopted in each individual case ; it may not, however, be amiss to mention a few leading points. Permanent contractions in the joints of the fingers, and rigidity of the flexor tendons, will be always best guarded against by laying the hand flat out on a splint of wood adapted to its general shape, digitated at its extremities, and properly secured ; while, in the intervals of the dressings, a gentle motion of the fingers, thumb, and wrist, should be encouraged in the patient, or if, as often happens, he obstinately objects to it, effected by the hand of the surgeon himself. This should be done with tenderness and caution, wherever the injury may be ; but if the alleged contraction or rigidity is attributed to a wound, through a part where the principal nerves have not been injured, and whose muscles have evidently no power over the joint affected, all tenderness is criminality.

If the injury is real, and irrecoverable, as where the tendons, or a large mass of muscles, are destroyed, or if an ankylosis is threatened, we must endeavour to solicit such a position as may be least inconvenient to the patient. In the knee-joint the straight position is obviously the most convenient ; in the elbow, the arm should be kept in

the position usually employed when it is in a sling ; in the fingers the half bent position will be in general found the least liable to accidental injuries. \*

In the treatment of fractures, a false ankylosis, or a stiffness of the joints, which are necessarily immoveable during the cure, must take place to a certain extent. This was combated by the older surgeons, by fumigations with the smoke of aromatic gums, or balsams, as benzoin, &c. The application of simple heat by steam, gentle friction, and moderate exercise of the joints, will soon restore their mobility.

I have met lately with a secondary species of contraction, which admits of no relief that I am acquainted with. A serjeant had his pike wrench-ed out of his hand by a grape-shot, which struck the shaft of it. He felt no inconvenience at the moment, but shortly afterwards he complained of a prickling sensation, and loss of the power of the root of the thumb. This lasted at intervals for twelve months, when a gradual wasting of the muscles took place, the thumb doubled inwards to the palm of the hand, and at last became so immoveably fixed, that no degree of force which could with prudence be used could restore it to its natural situation.

In some contracted cases which have fallen

\* If a cicatrix is much contracted or ossified, the cure should not be despaired of before the effects of incision are tried.

under my observation, the muscular fibres have been observed either to be ruptured, or forcibly separated from each other, and sometimes absorbed to such a degree as to be unequal to the act of bending the limb. In one or two instances, an osseous deposition has been remarked on their bellies and their tendons. These cases admit of no cure.

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### INJURIES OF THE BLOOD-VESSELS.

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It is a popular opinion among surgeons, and even soldiers, and in a great measure a well founded one, that a bleeding gunshot wound is highly dangerous. A small vessel or congeries of vessels suffers immediate death from the rapidly inflicted contusion of a ball, and the wound in which they lie either discharges a few sluggish drops, or its hemorrhage ceases after a momentary spirt, and a secondary kind of oozing. A moderate sized vessel often bleeds actively, but within the power of timely assistance. A large artery, on the contrary, pours forth its fluid contents, if not fatally from quantity, at least so from the deranged balance of circulation which its wound produces. Much of the flow in all cases will depend upon the vessel being cut quite across and admitting of retraction.

Much will depend upon a small ball or sabre cut partially opening the vessel in its transverse or longitudinal direction ; but fatal experience shows us, that the numbers who die from the opening of a large and principal artery by shot, shell, or sabre, however inflicted, so pre-eminently exceed the survivors, as to set all calculation at defiance.

How the vessels escape so often as they do, has been a source of great surprise among surgeons, and is truly wonderful. Balls buff along them, pass between them, and traverse their courses in all possible directions, but leave them unhurt. Their elasticity has been considered as in a great measure contributing to this effect, and no doubt it does. Something also may depend upon their being in a state of dilatation or otherwise when the missile passes across them,\* but still much is left unexplained in the attempt at accounting for these phenomena. Where a round shot injures a large vessel, or a sabre divides it, (the carotid for instance, or the femoral,) immediate death is almost universally the consequence. Where a vessel of this class is opened within the cavities, no chance of recovery remains ; the cause and effects are almost simultaneous, and even in the first case death

\* *Vide* Morgagni, Letter 53, Obs. 34. A case was reported as having occurred in Flanders, where the ball passed close under the arch of the aorta, and the patient survived some days. The ball certainly passed in that *direction*, but not having examined the body after death, I cannot vouch for the fact.

amounts so near to certainty, that a bare possibility of escape is left, and no practical deduction can be drawn from a few solitary instances to the contrary. It must be recollected, however, that if a limb is entirely carried off, or if it is excessively bruised, little or no bleeding takes place; the vessels are paralyzed, and their organization almost destroyed; the effect is nearly the same as if they had been actually seared, a process to which the older surgeons, who were so familiar with hot irons, often compared it. A very singular instance of escape is given by M. Larrey in his *Mémoires*, in which an Aide-de-camp received a gunshot wound, which cut the external carotid at its separation from the internal, and at its passage through the parotid gland. Pressure from the fingers of an intelligent soldier upon the spot, and M. Larrey's subsequent bandages, saved the patient. I know of an English officer who was also saved in India from the effects of an arrow wound in the carotid by the same means. In the 9th vol. of the *New Medical and Physical Journal*, p. 95, is given the case of a man wounded in the femoral artery at Spithead, and saved by a subsequent operation at Haslar Hospital; and in the 3d vol. of the *Medico-Chirurgical Journal*, page 2, is given an instance of the carotid bursting and being taken up on the spot by the late Mr Fleming, a naval surgeon.

We have occasional opportunities in the field of at once tying the extremities of lacerated arte-



ries, and these should never be neglected, although perhaps in every case not indispensable. These occur where a limb has been carried off by a cannon shot, and where the vessels hang out like cords from the wound, without the least flow of blood from them; or where the extremities of the wounded vessel can be seen partially throwing out their blood in the bottom of a deep wound. In these, and in all other cases of divided arteries, the least reflection upon the anastomoses of the vessels will lead us to secure both the end next the source of circulation, and the more remote extremity. Mr Guthrie, in his excellent cases inserted in a periodical publication,\* has called the attention of military surgeons to this point, and his observations cannot be too forcibly impressed on their minds. But many cases occur where nature has herself completed the entire process of cure without any interference of the surgeon. I owe the following to that very able and experienced officer, Dr Dickson of Clifton, Physician to the Fleet.

#### CASE.

“ SERJEANT KELLY, of the 54th regiment, in the battle of the 13th of March 1801 in Egypt, had both arms shot away at the elbow-joints by the same cannon ball, and on the following evening was received, with a great number of wounded men, on board the *Braakel*, of which ship I was surgeon.

\* New Medical and Physical Journal, Vol. IV.

On removing the dressings, I was much surprised to find no appearance of a single blood-vessel being tied by ligature. Conceiving, I imagine, the case to be desperate, a piece of linen had been merely wrapped round each stump, and the supervention of syncope seems to have saved his life, by stopping the further effusion of blood. The left arm, which was the most ragged, and having the olecranon still attached, was amputated ; but from the low state to which the man was reduced, and the pressure of other cases, I was obliged to postpone doing any thing with the other arm ; and considering, after the time that had elapsed, that there was but little danger of bleeding, and wishing to see the result, a tourniquet was merely put on loose. The second operation could not be performed until the 25th, and the dissection of the amputated portion then satisfactorily showed, that ample provision had been made against the possibility of such an occurrence, for the end of the torn artery was completely obliterated and lost in the surrounding flesh, and for upwards of an inch from its extremity was described, by the surgeons who assisted me, to be solid, organized, and carnous. I say described, for, while on other duty, it had been thrown overboard. The poor fellow fevered, and died on the 4th of April."

From a few dissections which I have been able to make in similar cases, I can confirm this report of the appearances. But in the dissections and observations made by some eminent men in experi-

ments instituted expressly for the purpose, or undertaken under circumstances favourable to the elucidation of the point, where accidental injuries have presented themselves, clots of blood, or of coagulable lymph, or membranous septa, have been found at unequal distances from the orifice of the artery, and at distant points of time, so far as three weeks after the infliction of the injury. Dr Thomson, who for many years has paid unremitting attention to this subject, has found the internal coat burst on some occasions of non-bleeding ruptured arteries. In Dr Jones's Treatise, where many of the original experiments conducted by him and Dr Thomson are detailed ; in the excellent Treatise of Mr Hodgson, where Mr Guthrie's cases are republished ; and in the papers of Messrs Lawrence, Travers, and Crampton, in the *Medico-Chirurgical Transactions*, is to be seen the sum of all our present knowledge on this subject.\*

It is in the hospital that our most guarded attention is called for, and our most saving efforts made, in the expectation, or actual occurrence of secondary hemorrhage. In those cases, we must avail ourselves of every assistance which the history of surgery has from time to time presented to our

\* A Treatise on the Process employed by Nature in suppressing Hemorrhage, Lond. 1805. By J. F. D. Jones. Hodgson on the Diseases of Arteries and Veins, Lond. 1815. *Medico-Chirurgical Transactions*, Vol. IV. VI. &c.

notice. To pressure, and to styptics, we must give their due value, and a full trial to such an extent as prudence may warrant ; but it is to the actual ligature of the vessel that we are to trust in all cases where a trunk or important branch is injured ; and in cutting for them, correct anatomical knowledge is our only resource. Often, unfortunately too often, we find, that even this will not enable us to meet the exigencies of actual practice, and that the *mere* anatomist has made but one step to being a perfect surgeon ; a principal one, indeed, but no more conclusive, than the tributary arts of the chisel or the pencil, are, to the formation of a perfect architect. Much unmerited blame has been thrown on army surgeons, on this as well as other points ; by men who, with a minute knowledge of the natural structure, have not adverted to the pathology of wounded vessels. They prick for arteries in a dead subject, and they readily find them ; but the state of a blood-vessel in a wounded limb is very essentially different from what it is in a sound state, or in a body laid on the table for the practical purposes of anatomy ; and I have more than once seen a person of this class, after having cut upon a living blood-vessel with the utmost precision, and described its course with the most laudable minuteness, confess, with great surprise, that he was unable to secure it, and had actually left his patient much worse than he found him. The state of general health, the cause, extent, and na-



ture of the wound, the diseased state of the vessels or their natural connections, the “*engorgement*” of the parts with extravasated blood, or putrid sanies, the possibility of irretrievably injuring the limb by cutting its nerves, or the tendon of some muscle essential to the due performance of its motions, should all be minutely examined, and balanced in the operator’s mind ; and he will have certainly the best claim to the character of a judicious surgeon, who saves the limb of his patient if possible, but who does not hesitate between the probable salvation of it, and the certain loss of life.

But cases will occur, where, under circumstances the most promising to the patient, the loss of his limb is the sole means of preventing the loss of his life. These are, where an artery unfortunately gives way in the bottom of a deep wound, and where, by a few pulsations of the heart, the interstitial spaces of the muscles, and even their component fasciculi of fibres, are so completely injected with blood, that the distinction of parts becomes lost, and the vessel is not to be detected. This is an accident which I have seen more than once in military hospitals, in the view of the attending surgeons, men of boldness, humanity, and dexterity. But even among the less tumultuous scenes of a civil establishment, and during the routine of diurnal duties, the same unavoidable accident will occur. From within the walls of one of the most eminent, and under the cognizance of some of the



most able surgeons, I select the following example, of great interest and high value in a practical point of view.

#### CASE.

A MIDDLE aged man was brought into one of the hospitals of the capital, for a compound fracture of the left tibia, unaccompanied either by extensive laceration or contusion. He was placed under the charge of an excellent assistant, and the limb, for some weeks, seemed to be doing well, when suddenly hemorrhage came on during dressing, the assistant at the bed-side, and the surgeon of the hospital expected every moment. He lost about 20 ounces of blood before the artery at the groin was effectually compressed, and the tourniquet applied. The most diligent search could not detect the bleeding vessel. Amputation was therefore had recourse to. On examination of the arteries, it was some time before the branch from which the hemorrhage had proceeded could be discovered. It at last was found to be the anterior tibial, and the orifice in it was so minute, as with difficulty to admit *three hogs bristles*.

In another case, with which I have been favoured by Dr Thomson, a fatal secondary hemorrhage occurred about the 80th day after a pistol shot in the upper part of the thigh, where no trace of the wound of an artery could be detected, *even by the aid of injection of the diseased limb*.

Where a ball has passed close to, or lodges near or upon a principal blood-vessel, the utmost caution as to excess of every kind is to be most rigidly observed ; and more particularly when the sloughs begin to separate, and the eschars from the arterial coats may be naturally supposed to loosen.

And here I must entreat the young army surgeon not to allow himself to be lulled into a fatal security, by a supposition, that secondary bleedings from gunshot wounds are but of imaginary importance, and of rare occurrence. The supposition is absolutely erroneous.

Experience shows, that from the 5th to the 11th days are in general the critical periods to be watched. Dr Thomson, with that accuracy and discrimination which characterize his writings, divides secondary hemorrhage into three species, taking place at three distinct periods ; hemorrhage from increased determination of blood occurring from the 1st to the 5th day ; hemorrhage from sloughing of the arterial coats from contusion from the 5th to the 10th ; hemorrhage from ulceration of the coats of the vessels from and after the 10th to any distant period. To these the Doctor adds, what he appropriately compares to the spontaneous hemorrhage from capillary vessels opening on mucous surfaces ; a species peculiarly connected with excesses. \*

\* Report of Observations made in the British Military Hospitals in Belgium. Edinburgh, 1816, page 44.

When the bleeding vessel is in a state of perfect health, and within reach, then the actual ligature is, beyond all question, the proper means of relief. By careful dissection the vessel may be traced from the wound itself, and must be secured by a fine ligature on each orifice. If, however, as often happens, the original breach in the vessel cannot be discovered; or if, in the prosecution of our search after it, a number of enlarged and newly formed collateral vessels are opened, and a general oozing takes place, the main trunk above its first branch in the vicinity of the wound, or at its nearest and most convenient part, should be secured. And if the operation is performed before the patient is debilitated by excessive loss of blood, and when his constitution is yet sound, and unaffected by fever, which remarkably predisposes to rupture of vessels, or before the occurrence of gangrene, there is reasonable hope of success; but where he is suffering under disease, the vessels, whether in the wound itself, or much nearer to the heart, burst but too often under our ligatures, or ulcerate soon after their application, and leave amputation alone as our last resource, and even that resource not always to be depended on.

The reducing the immoderate size of ligatures; the separating the threads of which they were composed, and placing them in convenient points along the face of the stump or wounds; the actual removal of one half of the ligature employed in the

securing of arteries, as soon as it had served its purpose of effecting the knot ; \*—all these were progressive, and arrived at by very slow degrees ; but an improvement, which appears to me of great consequence, was the last of introduction, and is now the slowest of adoption, although the artery once secured, and the value of adhesion duly acknowledged, it is the most obvious of all. I allude to the plan of removing the ends of the ligature altogether, and thus leaving to an extensive wound the greatest possible chance of immediate union. No doubt, we could be furnished with a vast mass of *recollections* upon this subject, and enabled to collect materials for the history of short cut ligatures, from “*post facto*” contributions ; but, in the mean time, I shall state my own experience on the subject, and while I take to myself the merit of having been the first British army surgeon who followed the practice, and circulated the account of it, I disclaim all pretensions to originality. The

\* For this very serious improvement in ligatures, we are, I believe, obliged to a naval surgeon, James Veitch, Esq. late of the Naval Hospital, Plymouth, who, in a modest and convincing paper, published in the Edinburgh Medical and Surgical Journal, Vol. II. p. 176, under the title “The Inquirer,” and with the assumed signature of J. D., gives an interesting account of it. It is sufficiently well known, that Paré revived, or rather reinvented, the ligature in the latter part of the 16th century ; it had been previously known to Celsus in the 1st.

plan was suggested to me by one of my assistants, and I have since found that it was adopted in Scotland sixteen years before I ever heard of it.

In the early part of September 1813, an ingenious young gentleman, Assistant Staff-surgeon Hume, then in charge of a large ward filled with gangrenous cases, suggested to me, what he informed me he understood to be the practice of an American naval surgeon, (to which he was led, if I mistake not, by an accident,) viz. cutting the ends of the ligature off close to the knot, and allowing the parts to heal over it. I was much struck with the proposal. Independent of the plausibility of the plan, as promoting immediate union, I anticipated good effects from any accidental violence to the ligatures, or the intrusive interference of the younger dressers to accelerate their loosening, being thus prevented; for I had seen several instances, where, from the most gentle efforts, the ligatures were removed from the diseased vessels, and alarming hemorrhages took place. The plan was therefore adopted; thirty-four cases were at different times, between September and the January following, treated in this way; and as no inconvenience whatever followed, nor did the small particle of silk left behind give rise to any apparent irritation, I made a very favourable report of the "short cut ligatures" to Dr Charles Forbes, Deputy Inspector of Hospitals, and then principal medical officer of the station, in my monthly re-



port for October, and through him to Sir James M'Grigor, the head of the staff, presenting him at the same time with some of the small circles of silk, a part of which had come away with the dressings, while some had floated out on opening the little purulent pustules, which formed over the face of the stump, at the points where the arteries had been tied. Some few of the ligatures never made their appearance, and the patients complained of no uneasiness whatever.

Fully impressed with its utility, I recommended it on all occasions in conversations, and in the operation-room; and, on my arrival in England from the south of France, published an account of it in a paper, which appeared in the London Medical Repository, \* Vol. III. p. 177, upon the subject of Hospital Gangrene. Upon presenting this paper to a very ingenious practitioner, Dr Maxwell of Dumfries, I found that he had adopted the plan, as far back as 1798, and had not only been in the practice of it himself since that time, but, at his recommendation, it had been adopted in various operations, by more than one surgeon in the neighbourhood, with unvarying success. He was convinced that the silk, as an animal substance, is absorbed, after having suffered a decomposition. On this point I cannot speak with certainty. I have, however, dissected several stumps, where the

\* *Vide* also the same Journal, Vol. V. p. 221.

little circle of silk has lain quietly at the shrunk ligamentous-like extremity of the artery in a small cyst, formed by a thickened cellular membrane; but its more common fate is to be discharged with the dressings. The campaign of Waterloo furnished me with many additional proofs of the excellence of this plan, and whatever may be the intention, whether to heal the wound or not, I now never hesitate about cutting short the ends of the ligatures. A single thread, well waxed, (or at most two,) is quite sufficient for any ligature; the artery should be well drawn out from its sheath, and the ligature placed as high as possible. The natural retraction of the vessel will in most instances carry it out of sight, and unless gangrene or excessive sloughing take place, it will frequently never more be heard of, and I verily believe never will do harm.

Mr Guthrie, in his work on Amputation, makes an objection to the short cut ligatures; and as every suggestion of his is entitled to the utmost attention, I shall state his observations, which, upon the whole, are favourable to the mode I recommend, and then very briefly remark upon them, as far as my experience authorizes me to do. At page 93 he observes, "I know that many cases treated in this manner in the campaign of 1813 ended successfully, and healed in as short a time as the most favourable ones by the usual method; and at Montpellier in June 1814, M. Delpech, Professor of Sur-

gery in that university, showed me at least 20 cases, in which he had and was still practising this method with success." (I find that the Professor adopted it in the same disease as I did, the hospital gangrene.) "I have seen, however," continues Mr Guthrie, "in two or three instances, some ill-looking abscesses formed by them, and I suspect some disagreeable consequences will occasionally ensue if this practice be continued." In opposition to this *suspicion*, I can with the most perfect confidence appeal to all those gentlemen who saw the practice, and assisted in it at Bilboa, in cases of the most irritable and threatening nature, and to Messrs Bingham and Crofton, my confidential assistants at Brussels, who saw it performed repeatedly there by me, and assisted in the after treatment, for supporting me in the assertion, that neither pain, heat, or tumour, febrile exacerbation, or formation of pus, could be fairly traced to the short cut ligatures, which would not, in all human probability, as readily have succeeded to the ligatures usually employed; while, on the contrary, the progress of healing has been sensibly more rapid where they have been used. Mr Guthrie considers the improvement as very valuable in all cases that will not unite by the first intention, from its lessening irritation; adopting the practice, as he says, (page 94,) "in a view diametrically opposite to that of its advocates,—but it will be found very advantageous in all cases of

operations performed in unsound parts, or in irritable or bad constitutions, where union will not take place, or only in a slight degree.” Now, if, as I originally employed and recommended, the short cut ligature is used in wounds proposed to be closed immediately, and with Mr Guthrie in all those which must for some time be kept open, its claims to general use will soon be acknowledged. In the meantime, its adoption by Mr Lawrence, and its application and extension to aneurisms, &c. strongly testify its merits, and amply justify the confidence with which I have recommended it. \*

But to return from this digression,—Gunshot injuries often lay the foundation for Aneurisms. There are some instances, however, where our interference is not only highly improper, but often

\* *Vide* Med.-Chir. Trans. Vol. VI. p. 756. for Mr Lawrence’s paper. As I am only anxious for the fair investigation of this subject, I would also refer to an ingenious paper in the Lond. Med. Rep. Vol. VII. p. 353, by Mr Cross, whose deductions are not in favour of the short cut ligatures. Dr Thomson, who frequently saw me use them at Brussels, informed me, that in experiments which he had performed on dogs, he found the large short cut ligatures which he then used, work their way out through the integuments at distant points from their application on the large arteries, and without producing any injury whatever. My friend, Dr Fergusson, Inspector of Hospitals, since tells me, that in a tour through Sweden during the peace of Amiens, he witnessed the employment of them by the surgeons of Stockholm, and without any inconvenience resulting from their use.



fatal. These are the cases where a ball, passing close to, or between the artery and vein of a limb, but without primarily opening either, has so far predisposed the parts to sloughing, that an eventual varicose aneurism is formed.

The following case illustrates the progress and symptoms of this injury of the blood-vessels, and the fatality of operation. I shall briefly relate it, premising that moderate pressure, open bowels, and abstinence from every species of excess, form the rational mode of treatment ; and that, if operation is deemed necessary, ample time should be allowed for the growth or enlargement of anastomosing and collateral vessels ; and a much longer period, it is to be observed, will be required in a case of this kind, than in that where the whole undiminished force of the ventricle, and of the peculiar arterial action which prolongs the impulse, is employed upon the column of blood. \*

#### CASE.

PRIVATE —, of the — regiment, aged 24, received a musket-ball at Waterloo, in the fore-part of the right thigh, which brushed along the course of the femoral artery, about half an inch above the giving off of the profunda ; it passed inwards and

\* I beg to refer, on this very curious subject, to the ingenious experiments and observations of Dr Parry in his " Experimental Enquiry into the Nature, Cause, and Varieties of the Arterial Pulse," 8vo, London, 1816.



lodged. The wound healed without the smallest untoward symptom, and the man was soon so well, as to be employed about the wards. He left the hospital under my immediate charge, early in July, and on the 18th of the same month, or the 30th from the wound, he was taken into another hospital as an orderly. On the 61st day, he complained of a tumour which had been forming for three weeks, and had been attended with much pain. It came on, he said, in the act of running up stairs in the hospital, after having drank Lord Wellington's health. The extent of this patriotic draught I ascertained to be nearly one pint of brandy, and some quarts of strong Brussels beer, swallowed within three hours in an adjacent brothel, where he had passed the night with a most abandoned crew of Belgian prostitutes. I was called in at a very early hour of the morning to see the case, and I found an irritable pulsating tumour, about the size of an egg, on the apex of which, appeared the cicatrix of the original wound. It disappeared on pressure, and the neighbouring cutaneous veins, which were all remarkably full, and, if emptied by the finger run along them, instantly filled on its removal, swelled in proportion as the contents of the body of the tumour were pressed out. The limb in all other respects appeared perfectly natural. I requested the Staff-surgeon who had called me in, to mark this peculiarity, and I directed his attention to the sibilation and tremulous jarring mo-

tion of the veins, clearly distinguishable on each pulsation of the heart. This peculiar noise, motion, and compressibility, had been more perceptible ; and, soon after my first examination, had ceased entirely.

I deprecated all attempts at operation, as I was decidedly of opinion, that a communication had been formed between the artery and vein ; and the plan of cure then proposed was the immediate abstraction of 20 ounces of blood from the arm, the application of a cold saturnine lotion externally, the internal use of the tincture of digitalis, and a rigid diet on the plan of Valsalva. I heard little more of poor ——— except his dying groans. In an evil hour an operation of tying the external iliac had been proposed and performed some time after I had ceased visiting him. In less than 60 hours afterwards he was no more, gangrene having supervened immediately. Not a drop of blood had been transmitted to the limb, and the truth of my prognostic was publicly proved, by a communication which appeared between the vessels on dissection.

An interesting and instructive case has very recently occurred in the hospital of the 92d regiment in Edinburgh Castle, in which the external iliac has been tied by Mr Hicks, the surgeon of that corps, assisted by Dr Thomson and Mr Mackesy. It adds one more to the instances of this splendid triumph of British surgery, which the French operators even to this hour can scarcely

credit. But it is rendered, if possible, still more interesting, by the circumstance, that, after the artery was secured, although gangrene supervened in the limb, a successful amputation perfected the cure. The heads of the case are briefly as follows :—

“ William Bisset was admitted into hospital on the 1st of December 1816, with an extensive, irritable, and sloughing bubo in the groin. On the 26th of the month, the external pudic artery, which was involved in the ulceration, burst and discharged about a pint of blood, which was restrained by pressure ; a second hemorrhage took place next day, and the ulceration spread still farther. On the 31st, the blood sprung from the artery in a full jet, when the actual cautery and pressure restrained it. On the 12th of January, the hemorrhage again returned, and was controlled by pressure. It continued to recur so often from this period, that the life of the patient was in imminent danger, until, on the 22d, a dreadful discharge of blood threatened at once to terminate his existence. Constant pressure was now applied, and, next day, on consultation, the parts were accurately examined, when, on removing the clots, it was found that the femoral artery itself had given way. No other resource now remained but tying the external iliac, which was accordingly done as follows : An incision was made between three and four inches in length, through the integuments, in the direction of the artery, beginning

at Poupart's ligament, and carrying it upwards. The lower edge of the internal oblique and transverse muscles being divided, the artery was exposed, which being, with some difficulty, separated from the surrounding parts, and from the vein, a blunt curved needle was passed under it, a single ligature applied, and the edges of the wound brought together. On the 24th, the limb felt cold, and was insensible, except when firmly pressed upon. On the 25th, the skin about the knee became discoloured, and a copious sanious discharge took place from the wound. On the 26th, the discoloration extended, a vesicle formed about the centre of the thigh, and a considerable quantity of coagula and sanies was removed from the groin. On the 31st, the leg was extensively mortified. On the 1st February, tension and pain of the abdomen came on, which was relieved by a dose of castor-oil. On the 2d, separation in various parts of the thigh began to establish itself. On the 9th, amputation was performed at a point close up to the trochanter, every thing went on well afterwards, and the man perfectly recovered." \*

The cases of hemorrhage produced by excess of various kinds are numerous and striking; and in none more obvious than where there has been un-

\* This case has also been noticed in an Inaugural Dissertation, by Dr Tod. surgeon, 52d Regiment, entitled *De Femoris Amputatione in Cavitate Cotyloidea*, Edinburgh, 1817.

restrained indulgence with the fair sex. One case has come within my knowledge, in a wound of the chest, where fatal hemorrhage from the lungs took place from this cause ; and one, where an officer died of uncontrollable bleeding from an amputated arm, brought on by the same cause. A young officer, a patient of my own, with an amputated thigh, which was healed within half an inch, had, seven weeks after the amputation, an hemorrhage so violent from an excess of this nature, and a subsequent opening up at the stump to such an extent, as detained him under cure for three months longer. \*

The older surgeons, abounding as their works do with absurdities, lay down some judicious rules for the management of the diet and the passions of their patients. Abstinence is frequently enjoined by them, and no doubt much of the success of their charms, and of their sympathetic ointments and powders, depended upon the due observance of these rules. Paracelsus was most particular in this point. Wherever the inflicting weapon was greased with his ointment, great caution was to be

\* The examples of "*Mors in Coitu*" are very numerous among the collectors of cases. Donatus has recorded several ; lib. 4, chap. 17, p. 394. Morgagni gives some observations on the subject, extremely well worth perusing, in his 26th Epistle, where the immediate cause has been the rupture of a blood-vessel. Some celebrated men, among them Attila, have been carried off thus.



observed. “ Quo die quis inungit telum, (says Crollius, describing the rules to be observed on this occasion,) abstineat à venere !”

Hemorrhage from blows on the face of stumps are very frequent ; and many officers, who have boasted of an early cure, are in a worse situation at the end of three months, from exposing themselves to accidents, than those who have been confined to their chambers for the whole period. The great vascularity observable about the ends of stumps which have been injected after death, will sufficiently account for this ; and the inexpertness in the use of crutches, and the want of balance and support, which the removal of the principal part of an extremity occasions, will naturally produce numerous accidents. In these distressing cases, rest, moderation in diet, acidulated drinks, and the local application of cold, are the most useful remedies.

One more species of hemorrhage, but fortunately not a very frequent one, is produced by the secondary opening of an arterial branch in the parts concerned in compound fractures. No defined period can be assigned to the accident, nor is there any peculiarity in the mode of cure. I have already given a case of this nature, in which no cause could be assigned ; in some instances, it is occasioned by spiculæ of bone opening the vessel.

INJURIES OF THE NERVES.

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THE mechanical injuries of the nerves are entirely beyond the powers of art to relieve effectually ; but they are objects of great curiosity, and illustrative of many most important symptoms that occur in the course of practice. Complete divisions of a principal nerve are instantaneously followed by a total loss of motion and sense in the parts supplied by it. In partial lesions, the privation is not so complete. A secondary paralysis very frequently takes place without any immediate injury of the nerve, as in those cases where a ball has passed so close to a large one, or the plexus from which it proceeds, as to occasion an inflammation and consequent thickening of the neurilema or investing membrane ; or where, in a more distant transit of the ball, the tube formed by its passage swells to an extent sufficient to press on the nerve or plexus.

In some cases, the loss of motion and sensation on the injury of a nerve, either by a direct or partial division, does not take place to an equal extent, in all the parts between the injury and the extreme points of the limb. I have seen several cases where the nerves have been injured in their passage down the humerus, and the extremities of the fingers alone suffered, all the intermediate parts

possessing their full powers ; and others, where pressure on the crural nerve close to its exit from the body has affected one or two of the toes only. This can perhaps never be explained, until we can ascertain what particular nervous chords or fasciculi of chords go to particular parts and organs.

A very common and most distressing set of sensations are the shooting pains and sympathetic feelings, referred by the patient to the fingers or toes of an amputated limb, which in some persons exist for months, or even years, after the operation. In some, cold or damp weather, lightning, or an electric state of the atmosphere, or an easterly wind, will produce it ; in others, mental agitation, violent bodily exertion, intense thought, or excesses, particularly in venery, are sure to bring it on. In some instances it can be traced to no obvious source, in others it very clearly depends upon mechanical irritation. The following case is well worthy of notice.

#### CASE.

A GENERAL officer, of distinguished gallantry, was struck by a round shot during a very desperately fought action, which, buffing along his breast in an oblique direction, destroyed the arm, and left only the head of the bone and a very small portion of the shaft remaining. He was carried to an adjoining hovel, where the common amputation was performed under very unfavourable circum-

stances ; the night was coming on, the supply of candles was scanty, and the enemy's shot were flying in all directions. The General was placed under my care on the day after the operation. The variety of cross accidents from fever and extensive sloughing, it is not within my purpose at present to enlarge upon, but the first attempt at clearing the ligatures, and making gentle pressure on them, was attended with pain so excruciating, as to leave no doubt that each included a nerve, or was in a certain degree connected with some large nervous filaments. This agonizing sensation was not felt except the ligatures were pulled at, and then not in the stump itself, but referred to the finger, thumb, wrist, elbow, or even to the external skin of the lost arm, as one or other ligature might be handled. I have sometimes been led to think, that the General uniformly felt the same sensations when the same ligature was touched, as I generally made my attempts to extricate them in a regulated succession, and his complaints were often of the same succession of parts. More attentive observation, however, convinced me that this was not the case ; for if any one was pulled with more steadiness than another, he complained of all the parts suffering pain simultaneously. One small ligature, if pulled in an oblique direction *inwards* towards the axilla, always gave him imaginary pain about the elbow or in the skin ; but if the same was pulled strongly and directly *downwards*, the

fingers were complained of. He has, frequently after the smarting of dressing was over, with great accuracy pointed out on my arm the course of the internal cutaneous nerve, as the site of his ideal pain ; often he has described that of the external ; and, on one occasion, I, with utter astonishment, had the general neurology of my arm and fingers traced by him. But unless the ligatures were pulled at, he had no other uneasy sensations than those which usually occur in persons whose limbs have been amputated. Once only did I ever know him refer his pain to the seat of the sensorium itself. On that occasion, from using an artery forceps to the ligatures, on which the slide moved rather stiffly, I exerted a greater force than I had intended. He convulsively put his hand to his head, expressed a sense of exquisite pain in his brain, involuntary tears dropped from his eyes, a paralytic contraction momentarily affected his mouth, an universal paleness spread over the uncovered parts of his body ; and, although unusually tolerant of pain, and of a most remarkable equanimity of temper, he uttered a piercing cry, and exclaimed, “ that the agony in his head and neck was unsufferable.” The state of collapse was so great, that I was obliged to send an aid-de-camp instantly for volatile alkali, and a glass of Madeira, by which he was soon relieved ; but the painful sensation, and the prostration of his strength, continued through the day. A British admiral was present on this and various



other occasions, and observed to me, after I had confessed my inability to explain, even to my own satisfaction, the cause of all these sensations, "that he never saw the General dressed without applying mentally to the wonderful sympathy manifested on those occasions, the expression of Pope, "it lives along the line." I believe we must be content with the fact, without seeking for the explanation.

To account for the mode of action of the nerves, or the connection between mind and body, will perhaps never be permitted us in our present state of existence; and we, who, to use the language of the Swedish philosopher, \* "have calculated the laws of motion for distant worlds," are in profound darkness on important points connected with our own. There is no doubt, however, that the principle of perception exists in full integrity in the cerebral mass, even after these "internunciate chords" are divided. The investigation of this most curious subject belongs to the physiologist; unfortunately, the little purpose to which it has hitherto been pursued is but too obvious. It remains for me to say, that, after various gentle attempts at cutting, pulling, twisting, and a graduated and constant strain by means of appending

\* View of the Progress and Present State of Animal Chemistry, by J. J. Berzelius. Translated from the Swedish by Gustavus Brunnmark. London, 1813.

small weights, or tying the separated threads of the ligatures over little quills of plaster, and similar contrivances, fully a year elapsed before the last ligature was removed by my friend, Dr Irwin, Deputy Inspector of Hospitals. The general's health did not suffer; and the unanimous opinion of the best informed surgeons was, to try no violent measures or extensive incisions, but trust to constant gentle means and the slow operations of nature.\* An experiment of placing a ligature on the axillary plexus, or on any single nerve in the dead subject, will shew what an obstinate resistance is offered after the protrusion of the medullary substance, by the subsequent puckering of the tough investing membrane, which during life will not admit of the ligature sliding off, either until the part is absorbed in course of time, or the materials of which the ligature is composed undergo some decomposition.

Although examinations after death, or after

\* Mr Bingham, Hospital-Assistant, assisted me in dressing the General daily. He was also occasionally seen by Mr Gunning, Surgeon in Chief, and by Drs Thomson and Somerville. Mr Brownrigg suggested some ingenious modes of removing the ligature.

Portal, *Cours D'Anatomie Medicale*, Vol. IV. p. 290, may be advantageously consulted on this curious subject; and also Lamorier, in the *Mém. de l'Acad. de Montpellier*, anno 1737. See also the *Acta Medica Berolin.* Dec. 2, Vol. VIII.

the removal of a limb, by showing the site of balls, splinters, ligatures, &c. will often very satisfactorily explain the source of many nervous symptoms, yet we are frequently left altogether in the dark.

In the very interesting case given us by Dr Denmark in the *Medico-Chirurgical Transactions*, Vol. IV. the source of the patient's torture, approaching to *tic douloureux*, was satisfactorily traced to the imbedding of a portion of a leaden ball into the posterior part of the radial nerve; but although a lesion of this nature was suspected previous to amputation, and indeed almost demonstrated, by the symptoms and the site of the wound, yet, on mature reflection, amputation was preferred to any partial excision of the nerve. And I apprehend, if we consider the great extent to which the thickened and diseased state of the investing membrane of nerves may reach; the certainty of greatly lessening, and perhaps eventually destroying the motion and sensibility of the parts to which they are distributed, by cutting off the communication with the sensorium; the contracted or distorted state in which the limb generally is; and the possibility of exciting universal and highly dangerous commotion of the system; we will rather prefer the almost certain effects of amputation, where any operation is required, to the more brilliant but ambiguous promises held out by a dexterous dissection.

Surgery has little positive aid to give in cases of

wounded nerves, and even of the phenomena attending them our knowledge is limited. In the living subject, according to Prochaska, a divided nerve retracts, and the medulla is expelled from its extremities, but more copiously from the upper than the lower end. In many cases, however, particularly in the axilla, the nerves protrude considerably, so as to require removal in cases of high amputation. The ends of divided nerves are united by a new formed matter, but it has been disputed, whether this was real medullary matter or not. Dr Haighton, in the *Philosophical Transactions* for 1795, proves that this new matter will perform the functions of a nerve, and this appears to me conclusive upon the point. These functions are, however, restored but very slowly, and not by any means uniformly. Nor does the assertion of Cuvier, that the power of motion is restored upon the re-union, but the sensation lost, universally hold good. The total division of a partially wounded nerve is the only operation recognised by modern surgeons. The experiment is, however, hazardous and uncertain, and I have principally confined myself to venesection, with emollients to the parts, which I have employed with advantage where the accident was suspected.

Œdema is a very frequent consequence of gunshot injuries of the extremities, and is generally complicated with pressure on the lymphatics, or injury to the nerves, either immediately, or from the

tumefaction of the parts from inflammation. By the use of gentle friction, with moderately stimulant embrocations, succeeded by the local shower-bath, and the subsequent application of a firm flannel-roller, this troublesome symptom will be in general benefited after some time. I have also derived essential relief from the distressing numbness of the fingers in such cases, by the frequent evaporation of sulphuric æther upon the part. I have never noticed injuries of the lymphatic vessels themselves, unconnected with general affections of the limb.

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#### OF SOME GENERAL AFFECTIONS OF THE SYSTEM FROM WOUNDS.

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THE prevention of fever, or the lowering of its violence when formed, is an object of most serious importance in the medical treatment of wounds; and without strict attention to the constitutional symptoms of our patient, the best operation, and the most judicious local treatment afterwards, are of no avail. In the preceding observations, I have with this view touched upon the necessity of carefully investigating the state of the bowels and the skin, and regulating the diet of the wounded, their personal cleanliness, and



that of the hospitals in which they are placed. It does not come within the limits I have prescribed to myself, to enter at large into the detail of the various species of fever which appear in military hospitals, or supervene upon wounds. I shall, however, make a few observations on some points which appear to me of considerable importance to be attended to by the less experienced practitioner.

The inflammatory symptomatic fever, which succeeds to wounds and operations, is by no means uniform in its period of attack, nor does it run through its course in conformity to any known or established laws. Its invasion, which is most generally influenced by the violence of the injury, the irritability of the patient, or the importance of the injured parts, is sometimes remarkably retarded, so as to give rise to very fallacious hopes; and whether it is, that this violence is only suspended to acquire additional force, or that its late appearance throws both patient and surgeon off their guard, in the very important point of diet, it so happens, that those cases are generally the most ambiguous in their results.

Neither are the quickness of pulse, or the heat of skin, infallibly indicative of the presence of fever, or of its probable termination; and therefore it is, that the state of the tongue, stomach, and stools, and of the senses, should be most particularly attended to. Sobriety is so rare a virtue among soldiers, that many alienations of mind are

attributed to drunkenness, which, in reality, are the consequences of fever ; and the deception is the more complete, that the look and general appearance often combine with the state of the senses, to deceive the incautious and superficial observer. But though he may be misled as to the presence of intoxication, he can never do wrong if he treats the case as if that state actually existed ; for it should never be lost sight of in practice in military hospitals, that there prevails an almost universal propensity to excess, both in drinking and food, which is increased by the military theory that refers all disease to weakness, and is countenanced and assisted by the attendants, who are of the same class of society, and imbued with the same prejudices as the patients. The principal remedy, then, in the cure of this fever, will naturally suggest itself ; this is, purging ; and the grand preventive is abstinence. In the administration of the remedy, no difficulties will be thrown in the way of the prescriber ; but he is assailed at every turn by solicitations to relax the rigour of diet ; and it requires a very strong conviction of its necessity, and no small share of self-command, to resist. The character of a young man stands high with the soldiers in proportion to the extent of extras on his diet-roll, but the success of his practice is *invariably in an inverse ratio*. Where, however, indulgences may be conceded with safety or advantage, his humanity will be best exerted in witnessing the administration of the

articles he orders ; for too often they are commuted for spirituous liquors, for the mutual participation of patient and nurse.

In the Symptomatic Inflammatory fever from wounds of the head, thorax, and abdomen, our grand dependence is upon general blood-letting ; but it is not often necessary in wounds of the extremities, without évident topical congestion in them. The use of local blood-letting by leeches is, however, of great importance, as is also the topical application of cold ; although insuperable objections, from the immobility of the patient, often exist to the employment of the general affusion.

If the fever is obviously kept up, as in compound fractures, by great local irritation, our only resource is Opium ; and, however theory may condemn it, or practice sanction the condemnation in idiopathic fevers, we have no better remedy in those now under consideration ; but it should invariably be administered by the prescribing officer himself, or under his observation.

There is a circumstance well worth attending to in the administration of opiates, viz. their effects on the bowels, skin, and urine. The well known constipation they induce, must be guarded against by proper remedies ; but an effect of the sympathy which exists between the skin and kidneys, and which produces an increased flow of perspiration, together with the secretion of a very great quantity of animal mucilage and lithic acid, on the use

of opiates, is not to be confounded with the state of the skin and urinary depositions resulting from fever. \*

The Hectic form of symptomatic fever, of which so much has been written, and for which we have no positive preventative or remedy in medicine, is as irregular in its periods of attack, in its violence, and in its duration, as the inflammatory symptomatic fever which generally precedes it. It seldom, if ever, comes on without the existence of suppuration, and yet the speedy establishment of a healthy suppuration is one of the most promising preventatives to its appearance. All states and stages of wounds are subject to it, but I am not aware of any in which it can be predicted to a certainty, although the weakly, and those who complain much of pulmonary and of rheumatic affections, or constant ingurgitators of ardent spirits, have been the general subjects of it in my practice. Where the part admits of removal, it is the only cure; and on the proper period I shall offer some observations when I treat of amputation. Where it does not, the whole treatment may be summed up in the words of the venerable Heberden. "The principal, if not the sole attention of the physician, must be employed in relieving symptoms." Here, again, restrictions in diet are of the most vital im-

\* For a full view of the symptomatic and hectic fevers, *vide* Thomson's Lectures on Inflammation, pages 102 and 323.

portance, and the access to wine or spirits is *poisonous*. The medicines to be employed must entirely depend upon the particular circumstances of the case. Opium is extremely useful, and with some, Bark is held of considerable importance.

On the mode of administering Bark, and even on its necessity or utility, a great diversity of opinion prevails at the present day. For my own part, I have given it what I conceive to be very fair trials; and although I would not reject it altogether, I must confess its powers appear to me by no means to justify the reputation it once had. That it has been abused, not only in the quantity and mode of its exhibition, but in the cases in which it has been employed, admits of no doubt; but, upon the whole, from the result of many trials, I am led to prefer aromatic bitters, with occasional alkalies, to any form in which the bark can be used\* in general hospital practice. As an external application, I am now convinced it is at best inert; and it has the very serious inconvenience of disguising the appearance of wounds, and detracting much from their cleanliness.

As a British soldier confessedly exceeds those of all other nations in excellence and completeness of clothing, in regularity of the supply of food, and in external parade cleanliness, so is a British

\* When it may be thought necessary to employ bark, the judicious observations of Dr Balfour should be attended to. *Vide* the General Preface to his Collection of Treatises on Solar Influence, 8vo, London.



barrack or hospital, while under proper control, and a correct system of internal management, pre-eminently distinguished above all others. But while we bestow this praise, so justly due to our own troops, let us not withhold from others that justice which is due to them. In the armies of other nations, drawn from southern Europe, sobriety is a leading feature. Cleanliness, although not very striking in their exterior appearance, is much more generally attended to by frequent bathing than among our own soldiers; their periods of rest and exertion, too, are more regulated than with us; their minds are more cheerful, and they are more inclined to social converse; while their communication with the other sex, is rather a sentiment, than an ebullition of brutal passion. These are points so striking, as to be obvious to the most inexperienced eye, even on a cursory glance; but to bring it more fully into view, and to trace the effects of the difference where they become most obvious and most essential to the soldier's welfare, it is only necessary to look at a British and a Foreign soldier arriving wounded from the field of battle at the gates of an hospital. The demeanour of the latter is such as would almost lead to the opinion that he was equally drilled to the tactics of the hospital, as the field. In our own soldiers, their energy in action is seemingly unaccompanied by any prospective view of what may happen them afterwards. They

too often come either furious or stupid from intoxication, totally bereft of their necessities, or with such a mass of rags, as serve only for fomites of contagion, and often with a female attendant, whose appearance and behaviour are more those of an infuriated bacchanal than a nurse. The humanity of our Government admits of a certain number of women per company to embark with troops proceeding on service ; and hence, perhaps, this part of the evil is not to be remedied ; but to prevent, as much as human foresight can do, the generation and introduction of fever into a new-formed hospital, no individual of either sex should be admitted, without a rigorous examination and purification of their persons and their baggage. In the establishments where proper stores have not been provided for the knapsacks or “ kits,” as they are technically called, of the soldiers, they but too often form the pillow of a wounded man, and, perhaps, from a defect of bedding, it may so happen that the blanket, in which he himself, his wife, or his child have slept, or been sheltered under for the course of a campaign, becomes a part of his covering in the wards. Where this evil is inevitable, a minute inspection of these articles becomes an imperious duty ; the heterogeneous mass contained in the knapsack of a soldier, particularly if a married man, is often truly ludicrous and lamentably offensive ; no ceremony therefore should be used in removing every thing from his imme-

diate possession, except his actual necessities, and whenever his blanket, or ordinary clothing, can be subjected to immersion in boiling water and subsequent baking, it should never be omitted. The visiting surgeon should not be contented with the ordinary parade cleanliness of a smooth chin, and clean hands, but look especially to the body and lower extremities. To persons accustomed to the decencies of civil life, it is inconceivable what a varnish of filth is observable on the legs and feet of soldiers, not only disgusting to the view, but demonstratively obstructive to the due course of exhalation from the skin, and beyond every doubt a most fertile source of fever of the worst description. The antipathy to a free admission of air, and the predilection for crowding into corners and huddling up their bedding, are also very leading features among them, whether in health or under the pressure of disease. A graduated temperature and the regulated admission of air into clinical wards, is the established practice in all well-regulated hospitals; but in the surgical wards, especially after an action, and with numerous compound fractures, and other profusely suppurating injuries, nothing short of a full, free, and uniform current of air throughout the whole can prevent infectious fever. In fact, a ward which barely presents covering from the inclemency of the weather, and shelter from the direct stream of air upon the bed of the patient. The temperature of

this air may be regulated by fires, and individual cases may be accommodated with an additional supply of blankets ; but the true process of disinfecting a ward, or preventing its ever being subjected to contagion, is to provide for a constant renewal of its atmosphere. Occasional ventilation will but partially remedy the evil, for the tenacity with which the effluvia of animal bodies adheres to the substances exposed to them is very remarkable. The late illustrious philanthropist, Howard \*, gives us a most striking proof of this, in his observations on the air of prisons. “ My reader,” says he, “ will judge of its malignity, when I assure him, that my clothes were, in my first journeys so offensive, that in a post-chaise I could not bear the windows drawn up ; and was, therefore, obliged to travel on horseback. The leaves of my memorandum-book were often so tainted, that I could not use it till after spreading it an hour or two before the fire : and even my antidote, a vial of vinegar, has, after using it in a few prisons, become intolerably disagreeable.”—“ Dr Hales, (he adds in a note,) Sir John Pringle, and others, have observed, that air, corrupted and putrefied, is of such a subtle and powerful nature, as to rot and dissolve heart of oak ; and that the walls of buildings have been impregnated with the

\* The State of the Prisons in England and Wales, by John Howard, F. R. S. Warrington, 1777. Quarto, p. 13.

poisonous matter for years together.” Some of the villages in Portugal, which had been occupied as hospitals during the peninsular campaigns, became so saturated with contagion, that a few hours residence insured to many a paroxysm of headach or fever, if a copious, bilious, vomiting, or diarrhœa, did not prevent its accession. The inefficiency of Fumigations is now pretty generally acknowledged by their most sanguine admirers ; where I have lately employed them, it has been more from a compliance with custom, than from any conviction of their utility. That some of them correct the fœtor of the discharges from suppurating surfaces, is well known, and in such cases they have their merits ; and if they cheer the spirits of the wounded, or tend to promote the circulation of air, they are not to be entirely rejected ; but where they, in the slightest degree, interfere with thorough ventilation, or cleanliness, they must be hurtful. A very striking proof of the inefficacy of the process of Guyton Morveau, for purifying infected air, or obviating contagion, was mentioned to me in conversation some time since, by a learned and industrious Professor. In his examinations of several of the continental establishments, he found that one of the earliest victims to a contagious fever, which raged at the principal hospital of a large capital, was the man who “ *ex officio*” fumigated all the wards, and re-



spired scarcely any thing else but a medicated atmosphere.

Among the numerous proofs that we have of the efficacy of pure air on the sick, none is more interesting than that given by the most scientific traveller of this or any other day, Humboldt, in his *Personal Narrative*. “A sailor,” says he, “who was near expiring, recovered his health from a circumstance that is worthy of being mentioned ; his hammock was so slung, that there was not ten inches between his face and the deck. It was impossible to administer the sacrament in this situation, for, agreeable to the custom on board of Spanish vessels, the viaticum ought to be carried by the light of tapers, and followed by the whole crew. The patient was removed into an airy place near the hatchway, where a small square birth had been formed with sail-cloth ; here he was to remain till he died, which was an event expected every moment ; but passing from an air extremely heated, stagnant, and filled with miasma, into fresher and purer air, which was renewed every instant, he gradually revived from his lethargic state, and his recovery dated from the day when he quitted the middle deck.”

The constant and uniform renewal of the air is an object of prime importance at all times ; but it is at night that it is more particularly required in the wards of an hospital. The eye of the superintending officer can, during the day, always

detect the more obvious accumulations of filth ; but at night the excrementitious discharges of the patients are allowed to accumulate ; all the beds of the ward are occupied by those who, during the day, were kept for a time in the open air. Lamps and candles tend still more to consume the vital part of the atmosphere, and it is highly probable that the natural nightly exacerbations of disease, tend to eliminate from the bodies of the patients, exhalations which still more powerfully contribute to vitiate it.

I may perhaps be permitted to adduce my own case, in further illustration of a subject, which can never be enough impressed on the army-surgeon. While the British army were encamped upon the heights of Sobral, covering the approach to Lisbon, and watching the movements of the French under Marshal Massena, in 1810, it became a matter of necessity to have the whole in a state of preparation for movement at the shortest notice. Our baggage, therefore, was always ready packed at night, and we remained ready to turn out at a moment's warning. I procured what I conceived to be a very ingenious contrivance as a substitute for a bed. I had a new blanket sewed up in the form of a sack, with a running string at its mouth ; into this I got at night, and, tying it round my neck, slept very comfortably on a piece of water-proof sail-cloth. The tents under which we lay were not of British manufacture, but a very thin

flimsy canvass, pervious to every blast. I continued in perfect health until the retreat of the French permitted us to get under cover of some half-burned villages. After some days spent in marching, I got into a house, and fixed my bed in a room with thirteen other officers, where we were perfectly secured from the inclemency of the weather. My birth was considered as particularly enviable, being in a very dry sheltered corner. I still used my blanket sack, but the violence of the rains prevented the possibility of exposing it to the air. On the third day, I was attacked by irregular chills and febrile heat, and before the 10th, my life was in imminent danger, from a combination of typhus and dysentery, and nothing but immediate removal to Lisbon preserved it. Three persons, who, in succession, used my blanket, and got into a *snug corner*, were attacked in the same manner, while all those who slept under the windows, or in the more exposed parts of the building, escaped all febrile affection whatever.

To filth, irregularities of diet, whether in quality or quantity, intoxication, crowding together and respiring a foul air, as sources of fever, is also to be added, a fact well known to all conversant with the diseases of armies, viz. the much greater susceptibility of contagion after the active part of a campaign is terminated, than while both body and mind are fully employed; a combination of all which causes often superadds to the horrors of

war, a scourge much greater than the sword itself. \*

From a consideration of the vast mass of evidence upon some of the points now alluded to, a very ready explanation is afforded of the peculiarities observed by the older surgeons among their hospital cases, and in the events of their various surgical operations. At some hospitals, one set of operations failed, another had its peculiar fatalities, each proportioned, no doubt, to the number of cases of any prevalent disease for the treatment of which the hospital surgeons were celebrated, or the district remarkable ; while, in the larger establishments, dedicated to the promiscuous reception of all cases, every operation, however trifling, was attended with unsuccessful results. Atmospheric influence, and all the absurdities of astrology were called in by our fathers to explain this simultaneous deterioration of their patients, and various and discordant states of the air were charged with the ill effects, which proceeded in a great

\* M. Larrey describes this fever as it occurred in the campaign of 1803. as does Pinel, in his "*Médecine Clinique*." Hufeland also published an account of it at Berlin in 1814 ; and Masnou has given some observations connected with it in the medical history of the siege of Torgau, in Saxony, in the *Journ. de Méd.* Vol. 36. It is not consistent with my plan to enlarge on it here ; but I trust some of the able army physicians, who served in Spain, will favour us with their observations on it. Pringle affords an inestimable model for all works of this nature.

measure from a want of its free diffusion. Nor do the results of our hospital operations in modern practice bear any proportion to the success of those in private life, although in each we attribute a fair share in the consequences to the climate, the season, and the nature of the prevalent diseases, as well as to the constitution of the individual.

On those powerful causes much of the peculiar appearances of wounds will depend ; and in proportion as they are understood and attended to, a knowledge of the true nature of these peculiarities will be acquired, and much of our uncertainty in the discrimination of morbid phenomena avoided. Hence, the history of particular epidemics will always be interesting. Under this conviction, I shall, without entering into a general description of the various forms under which the disease has been observed by others, offer the result of my own experience in one of the greatest scourges of military hospitals, known under the various names of Hospital Gangrene, Malignant Ulcer, Putrid Ulcer, Infectious Ulcer, Sloughing Sore, &c. \*

\* The following account of the gangrene at Bilbao first appeared, nearly in its present form, in the Lond. Med. Repository for March 1815. An excellent summary account of the disease is given us by Professor Thomson, in his *Lectures on Inflammation*, p. 456. Professor Delpech of Montpellier published a still later account of hospital gangrene in 1815. But the most interesting paper that I am acquainted with, is



ON HOSPITAL GANGRENE AS IT APPEARED IN SOME  
OF THE ESTABLISHMENTS IN SPAIN, PORTUGAL,  
AND THE NETHERLANDS.

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THE military events on the Peninsula during the month of July 1813, in which the action of Vittoria was fought, rendered it necessary to form several hospital stations in the provinces of Alava, St Andero, and Biscay. Among these, Bilbao was selected as capable of accommodating a large number of sick and wounded, as being easy of access, and remarkable for its salubrity.

The principal hospitals were distant about four miles from the town, and six from the sea. They consisted of a noble convent, which was occupied chiefly by medical cases; and of the upper floor of a very extensive building, formerly a rope-walk belonging to the Spanish government, which was exclusively allotted to the reception of surgical cases, and placed under my care.

The Cordeleria, or Rope-walk Hospital, was built on the southern bank of a small but rapid

one by Professor Brugmans of Leyden, in the "*Annales de Litterature Medicale, Etrangere et Nationale*," for July 1815. The 106th and 107th numbers of that work, or the first two of the 19th Volume.

stream, the Ibaicabal, which runs through a fertile valley, gradually opening from the town of Bilbao to the Bay of Biscay. Its waters, which rise in the lofty mountains that bound Alava and Biscay, are strongly impregnated with iron, and teem with wholesome fish. The tide in the vicinity of the hospital rose between six and seven feet, and extended its influence about four miles up the stream.

The soil in the immediate vicinity of the hospital was dry and gravelly; shelving gradually from the water, until, at the distance of a mile, a lofty ridge of mountains rose behind, and perfectly screened it from the winds. These mountains, the highest of which is said to be, by barometrical observation, about 1400 feet above the level of the sea, abound in iron. On the opposite bank of the river, a chain of hills stretch along at the distance of half a mile, leaving between their base and the water a fertile and well drained flat.

Good water was scarce in the immediate vicinity of the hospital; although, with a very little arrangement on the part of the natives, a pure and never-failing stream might be brought from the neighbouring hills. This necessary article, as well as our provisions, which were wholesome and abundant, was supplied from the town by boats.

The prevailing winds, which were westerly and south-westerly, blew up the valley from the ocean, and a mild steady breeze usually prevailed. The

state of the barometer, and quantity of rain which fell, were not observed for want of instruments. During the latter end of August, and the beginning of September, at which period the hospital gangrene first made its appearance, the weather was mild, and we had a few refreshing showers. The thermometer at this period ranged from  $68^{\circ}$  to  $70^{\circ}$ ; but, towards the close of September, the mercury rose in the wards of the hospital to  $74^{\circ}$ , and one day as high as  $78^{\circ}$ . The nights were, however, generally cold, cloudy, and moist.

No epidemic disease occurred among the inhabitants during our occupation of this station. They were remarkably healthy and robust, and numerous instances of longevity were to be met with among them. The topography of the Cordelaria was not more favourable towards its selection as an hospital, than the interior of the building was comfortable, and adapted to the purpose. It was 1200 feet long, by 40 broad, and 16 in height, well plastered and floored, and raised 12 feet above the surface. A very important advantage enjoyed by this building, and one which I would strenuously recommend in all erections for hospital purposes, was, that the walls were perfectly free from cornice, pillar, or any ornamental projection whatever; neither were there presses, closets, shelves, or recesses, all of which I consider as serving no purpose so effectually as collecting and secreting filth, while the ends for which they are generally employed can be attained much better by a proper

distribution of tables and benches. In this hospital, also, we had the important benefit of several doors and windows, *extending to the floor*, with large staircases at each end of the building, and ample room for our stores, provisions, &c. Had we had bedsteads, I could not have desired a better hospital, even though curtains had not been supplied, a deficiency so feelingly lamented by Mr Roux \* in his late visit to our public establishments. On the first occupation, however, there were deficiencies in many articles of comfort and convenience. The circumstances of the times extinguished all hopes of receiving effectual assistance from our allies, while the rapid movements of the army, and the distance of our stores, cut us off from the prospect of immediate supplies of our own. Our bedding, therefore, was extremely scanty; the wounded lying upon straw, laid upon the floors, and very much crowded together, which was one cause, no doubt, of the rapid progress of contagion. Our medicines also, and other materials, which were purchased principally from the Spaniards, independent of the great exorbitance of their price, were of the very worst description. We did not long, however, labour under those disadvantages; the talents and industry of Sir James M'Grigor, the head of the hospital staff, soon removed every

\* Narrative of a Journey to London. Translated from the French. 8vo, London, 1816.

cause of complaint, and our supplies became excellent and abundant.

In an hospital, situated as I have described, I found, on my arrival from Vittoria, in the last week of August, 1000 wounded men ; the larger number of whom had arrived in successive escorts from the same place, many in waggons, and carts ; but a large proportion was so slightly wounded as to be able to complete the journey (19 leagues) on foot. The remainder of our patients were brought from the lines before St Sebastian, by sea ; \* and these exhibited by far the most formidable cases. The sloughing sores had all been collected into a separate airy ward, on the second floor, and were reported to me as mild, and yielding easily to the treatment adopted ; but, as I was well aware of the insidious nature of these cases in a large hospital, full to an overflow with gunshot wounds, pouring in under all the circumstances of a siege, or a great battle, and of the confusion consequent on such events, I was prepared for fever of the worst kind, and the most contagious nature. Under these impressions, I laboured incessantly on the police of the hospital, under the able orders and support of Dr Charles Forbes, then head of the station ; had the building separated into

\* An account of the gangrene, as it appeared at Passages, in the neighbourhood of that city, may be shortly expected from Assistant Staff-surgeon Blackadder.



wards, and divisions, opened ventilators, removed nuisances both within and without, and enforced the most rigid attention to personal cleanliness, and to the frequent renewal and airing of the bedding. I had a most striking instance; within my own experience, of what attention to these points can effect in the way of prevention ; for, at the general hospital at Elvas, of which I was principal medical officer during the whole period of the successful operation before Badajos in 1812, although 2500 wounded were treated there, yet not a single instance, either of hospital gangrene or typhus fever, appeared among them, although both these diseases had raged with unexampled fury the two preceding years. This happy result I attributed to cleanliness and ventilation, and to the removal of an enormous dunghill, the lower stratum of which was formed of the semi-putrid tow, and bloody bandages left after the battle of Talavera ; and which, on being turned up, was incrustated with the same kind of fungus mentioned by the older French surgeons, as appearing on the dressings at the Hotel Dieu.\* The smell emitted, while removing this decomposing mass, was almost insupportable ; and, together with the effluvia from two stagnant ponds, which I caused to be drained,

\* These fungi are very rapid in their growth, springing up in one night. Their species, I believe, is not determined. They were supposed to exist only on bandages moistened with oxycrate ; but they are by no means confined to them.

threatened the safety of the whole neighbourhood.

My fears were soon verified at the Cordeleria ; for in a few days the whole hospital was overrun with gangrene, which I more particularly dated from the arrival of some fresh wounded men from Vittoria, of whom about thirty were in an advanced stage of the disease, which, it was said, first appeared upon the journey down. The ward appropriated to sloughing cases at once became a horrid scene ; every sore in the house assumed a malignant character ; and the deaths increased in nearly a threefold proportion.

Our knowledge of the origin of contagions is altogether extremely limited ; I shall therefore offer no remarks upon the subject of that under consideration here, as I propose to confine myself solely to practical facts. These were observed at the bedside of many hundred patients ; and, without any reference to systematic arrangement, I shall describe them from my notes upon the subject, and as they struck me upon the spot.

Let us suppose that our wounded have all been going on well for several days, when suddenly one of our most promising patients complains of severe pain in his head and eyes, a particular tightness about the forehead, want of sleep, and loss of appetite, and that these feelings are accompanied with quickness of pulse and other symptoms of fever ; his wound, which had been healthy and granulating, at once becomes tumid, dry, and painful,

losing its florid colour, and assuming a dry and glossy coat. This is a description of the first stage of our Bilbao hospital gangrene ; and if a brisk emetic was now exhibited, a surgeon not aware of the disease that was about to form, would be astonished at the amelioration of the sore, and the unusual quantity of bile and of indigested matter evacuated by vomiting. In many cases, and particularly if the ward was well ventilated and not overcrowded, nothing more was done except to change the patient to another room, or, if that was not practicable, to remove his bed from the place where it stood, particularly if in a close corner of the ward, and not raised from the floor by boards and tressels, and to order him an entire change of bedding, while at the same time he was well washed with tepid water. If, however, this incipient stage was overlooked, the febrile symptoms very soon became aggravated ; the skin around the sore assumed a highly florid colour, which shortly became darker, then bluish, and at last black, with a disposition to vesicate ; while the rest of the limb betrayed a tendency to œdema. All these threatening appearances occurred within twenty-four hours ; and at this period also the wound, particularly if it was situated on a muscular part of the thigh, buttock, or calf of the leg, *whatever might have been its original shape, soon assumed the Circular Form.* The sore now acquired hard, prominent, ragged edges, giving it a cup-like ap-

pearance, with particular points of the lip of a dirty-yellow hue, while the bottom of the cavity was lined with a flabby blackish slough.

This rapid progress and the circular form of the ulcer were highly characteristic of hospital gangrene, and obtained almost universally, in every wound infected with it, wherever situated. I have seen the external ear in this manner destroyed, as if in a series of concentric circles, and the same occur during the destruction of the palpebræ. Even upon surfaces barely contiguous, as the fingers and toes, it generally spread in a similar manner ; so that the sore, which might have been on the middle-finger or toe, and confined entirely to it at the morning dressing, by night engaged the adjoining sound ones, and in less than twelve hours more embraced the whole foot or hand. The originally affected spot was always the centre of this wide-spreading diseased circle. Over the ribs, also, or over the interdigitations of the serrati muscles, the surface of the wound preserved the circular form, although the bottom was irregular or angular. The discharge in this second stage became dark coloured and fetid ; and the pain was extremely poignant.

The gangrene still advancing, fresh sloughs were rapidly formed, the increasing cup-like cavity was filled up and overtopped by them, and the erysipelatous livor and vesication of the surrounding skin gained ground, while chains of inflamed



lymphatics could be traced from the sores to the adjoining glands, there exciting inflammation and suppuration, which often furnished a new nidus for gangrene. The face of the sufferer assumed a ghastly, anxious appearance ; his eyes became haggard, and deeply tinged with bile, his tongue loaded with a brown or blackish fur, his appetite entirely failed him, and his pulse was considerably sunk in strength, and proportionally accelerated. In this stage the weakness and irritability of the patient was such, that the slightest change of posture, or the most delicate examination of the sore, put him to torture, increased by his inability to steady the limb, which, if moved at all from the bed, was seized with tremors and spasmodic twitches. I have never observed this spasmodic affection increase to tetanus in any one instance of the many hundreds which I have seen ; and I have been almost tempted to imagine the two diseases incompatible.\* When these nervous affections came on, the bravest soldier betrayed a symptom, which, in those of less strength of mind, formed a striking feature in every stage of the disease, viz. the greatest imaginable impatience of pain and depression of spirits. Men who had borne amputation without a groan, shrunk at the washing of their sores, and shuddered at the sight of a dead comrade, or

\* Mr Guthrie, however, has seen the diseases coexistent, and venesection effected a cure. *Vide* the paper of Sir James Mc'Grigor on the Diseases of the Army, Medico-Chirurgical Transactions, Vol. VI. p. 455.



even on hearing the report of his death, instantly predicting their own dissolution, and sinking into sullen despair. I have never in one single instance seen this irritability wanting ; and I am therefore led to suppose, that those practitioners who assert that they have seen whole muscles, nay limbs, come away without pain, must have mistaken the nature of the disease they witnessed, or have seen hospital gangrene in its chronic state, when large sloughs were separating after the febrile disease had subsided.

The third and last stage was now fast approaching. The surface of the sore was constantly covered with a bloody oozing, and, on lifting up the edge of the flabby slough, the probe was tinged with dark-coloured grumous blood, with which also its track became immediately filled ; repeated and copious venous bleedings now came on, which rapidly sunk the patient ; the sloughs, whether falling off spontaneously, or detached by art, were quickly succeeded by others, and discovered on their removal small thickly studded specks of arterial blood. At length an artery sprung, which, in the attempt to secure it, most probably burst under the ligature ; the tourniquet or other pressure was now applied, but in vain ; for while it checked the bleeding, it accelerated the death of the limb, which became frightfully swelled and horribly fetid. Incessant retchings soon came on, and with coma, involuntary stools, and hiccough, closed

the scene. Often, however, the patient survived this acute state of the disease, and sunk under severe irritation, absorption of putrid matter, and extensive loss of substance, without any other symptoms than those of hectic fever, arising from other sources.

While the acute symptoms, as above described, were proceeding in one part of the hospital, the same appearance began to spread through another at a distance ; for immediate contact, though highly dangerous, was by no means necessary toward the propagation of this most insidious disease. The stumps which had been nearly healed caught the morbid disposition ; those where healing by the first intention was reasonably to be looked for, opened, retorted their edges, put on an erysipelatous appearance, and, at last bursting up altogether, presented a frightful cup-like excavation, edged with the true characteristic *circular lip*. The slightest scratch of the dissecting knife festered ; ulcers, whether simple or constitutional, became gangrenous ; wounds long healed broke up, and fell into a state of foul suppuration ; nay, the skin, although perfectly sound, which had been touched with a sponge employed in washing the gangrenous sores ulcerated, and soon became itself a slough. This was often observable among the *orderlies* and *nurses*. It was not, however, a long residence in the tainted air that predisposed to the reception of the contagion, as I have seen illustrated in the case

of a soldier of the Royal Waggon Train. This poor fellow, who had just landed from England, and was under the influence of mercury, employed for a venereal complaint, died within forty-eight hours after his admission, the gangrene having seized on an open bubo in his groin, eroding the great vessels in the neighbourhood, and absolutely destroying the abdominal parietes to a large extent.

In this distressing state of our hospital, some few constitutions resisted the febrile affection altogether; some had extensive local disease, without any general affection. Those cases, however, I have principally observed to occur from the inoculated slough among the attendants, who occasionally respired a purer air than the patients; and among the assistants, whose accidental scratches were best treated by destroying the part with nitrate of silver. I have, moreover, seen among the servants and washerwomen, the febrile symptoms without any local affection; and this was clearly traced to washing the bandages and dresses. These cases readily yielded to proper remedies, principally emetics, succeeded by moderate and steady purging.

Such were the symptoms which characterized the hospital gangrene at Bilbao; one of the most subtle and destructive poisons that ever infested an hospital, attacking equally the most robust and most debilitated, and, if unchecked by medical aid, proceeding invariably to a fatal termination. Its

existence in any situation fortunately cannot be long overlooked ; for, to those who have once seen it, a glance at the sore, or even the smell of the ward, will immediately discover it. It can scarcely be confounded with any other disease or any species of ulcers ; it may indeed be mistaken by name (and I have seen this happen) for common gangrene, but the points of difference are very striking. It does not proceed from impaired organization of the parts, nor is it necessarily preceded by inflammation, cold, or pressure ; its progress is infinitely more rapid, and, when its course is checked, separation takes place in detached specks instead of the *waving line*. It is also often attended with hemorrhage, which rarely occurs in common gangrene. The two diseases, indeed, are frequently coexistent, and I have seen numerous instances of the lower part of a limb gangrenous from pressure, while a sore highly infected with hospital gangrene has occupied the upper part. To those who have seen such cases, or have had opportunities of comparing the difference of appearances of the diseased parts in two individuals, the diagnosis can never be difficult.

The skin and cellular substance, whether loose or condensed, seemed to be the parts originally and principally affected in the disease at Bilbao. This was obvious, even in the living body, but on dissection, the disease of these parts frequently was observed to spread much further than external appear-



ances would at all warrant us *a priori* in concluding, as we often found a diseased track running up into the groin or axilla, and completely dissecting the muscles and great vessels. This was, indeed, sometimes obvious during life, for on the casting off the sloughs, the muscles would appear as perfectly disengaged as the most accurate knife could render them, at the same time they would, for a long period, retain their florid colour and preserve their action. In very violent cases, however, the muscles partook of the disease, and either sloughed off in successive layers, or became converted into a flabby disorganized mass.

The thoracic and abdominal viscera did not appear to suffer peculiarly while the gangrene occupied the extremities ; but where the ribs or abdominal parietes have been the seat of disease, I have occasionally observed that the viscus, which corresponded in situation with the external sore, took on a diseased appearance. I have seen the lungs in two cases, and the pericardium in a third, covered with gangrenous spots ; and I have often observed the same appearance on the liver ; but I have never traced any thing of the kind on the membranes of the brain.

The bones, in some instances, resisted the contagion for a long time, either exhibiting no morbid appearance whatever, or barely throwing off a thin scale. In other cases, however, particularly where the ribs, sternum, or cranium were denuded,



they became carious throughout, and sloughed away; and the caries assumed the circular form, in strict correspondence with the shape of the soft parts. In some cases, a total absorption of the phosphate of lime took place, and the bone was converted into a cartilaginous mass; this circumstance I have met with twice, once in a diseased metacarpal bone, and once in the femur. In the former case, the dissecting-knife cut through the bone with as little difficulty as if it had gone through the cartilages of the ribs. The latter case was very remarkable; the patient suffered acute torture from a sloughing thigh stump, which, on an accurate examination, displayed the following appearances: A thickened cutaneous texture, hung like a loose pouch around a hard projecting mass, apparently consisting of diseased muscle; within which, corresponding to the size and situation of the bone, appeared a tough, dark body, exquisitely sensible. It had been touched with escharotics, lay loosely, and, on removal by a forceps, had all the external appearance of a stopper of cartilage, about two inches in length. On examining the spot more closely, the whole of the parts contained within the diseased skin appeared of the same nature, and the disease seemed to spread up to the trochanter. The patient had been affected only fourteen days; and for the last four, the disease appeared stationary. An operation was resolved on, which I performed, by first taking up the fe-

moral artery, immediately under the ligament, and then cutting as deep an inverted cone as I possibly could, I sawed off the bone immediately below the trochanter. On examining the amputated portion of the limb, the whole mass, with the exception of the skin, was found to be cartilaginous, retaining the shape of an enlarged bone, but not the smallest trace of osseous matter. The tube of thickened periosteum in which it lay, alone exhibited a few detached specks of ossification. The operation succeeded, and the patient embarked in six weeks.

The blood-vessels were affected as variously as the bones. In some rare cases, I have seen the femoral and axillary arteries pulsating awfully, and apparently unaffected with disease ; while all the surrounding parts were completely destroyed. But in a vast majority of cases the blood-vessels partook of the general disease in which they were imbedded. They were not only completely separated from their natural connections, but their coats sloughed away at the immediate point of disease, while the disposition extended far beyond the apparently affected spot. Hence, our ligatures but too often failed on the main branches, and any attempt on the smaller was invariably injurious. We were here naturally induced to tie the artery considerably above the seat of the disease ; and this was done, once on the femoral, and twice on the axillary artery ; the former burst on the third, each of the latter

on the second day afterwards: these ligatures were applied, no doubt, in the height of the gangrene, when all operations are hazardous. In general, the great vessels sloughed long after the acute symptoms of the disease had abated; in severe cases, under such circumstances, we always dreaded the eleventh day of the disease.

The state of the vessels was well illustrated by the following experiment. During the performance of an operation on the middle of the humerus, every preparation was made for the injection of the limb: immediately on its separation a pipe was fixed into the brachial artery, and a coarse tallow injection, blood-warm, was slowly thrown in. The gangrenous cup which occupied the bellies of the flexor muscles, and extended down towards the wrist, and the palm of the hand, was immediately filled with injection, which oozed from every point of the surface, while the main artery totally gave way.

In the treatment of the Bilbao hospital gangrene, although the ulceration might, to a superficial observer, seem to claim the first notice, yet it was to the constitutional treatment that we paid particular attention. We regarded external applications, notwithstanding an obvious change of type in the accompanying fever, as merely a secondary object; and, in truth, I must confess, that I viewed them as operating more by the cleanliness and attention to the patient, which

their frequent application implied, than by any intrinsic value which they possessed in themselves.

In every case of the disease on the first invasion, as well as on occasions of threatened relapse, the *primæ viæ* were cleansed by full emetics, followed by purgatives; and the state of the bowels and skin were carefully attended to throughout its whole progress. On the supervention of typhoid symptoms, which, during the months of August and September, very early made their appearance, the cure was conducted on the same principles as guided us in the treatment of pure typhus, administering in the latter stages opium in large doses, aided by a nutritious diet, and a liberal allowance of the best wine we could procure. Bark, in decoction, was for some time much and copiously employed, but I have seen great harm done by large and injudicious doses of this drug before full evacuations had taken place, and the sloughs began to separate. I need scarcely say, that a remedy so strongly recommended as Venesection had early occupied our attention; but previous to the month of October, the obviously typhoid type of the disease made us extremely averse from employing it. At that period, however, a change in the weather, from sultry to cold, and even frost (at night) took place, marked by a corresponding change in the thermometer, which, at its medium range, was  $20^{\circ}$  lower than in the preceding month. It progressively sunk during the winter to the



freezing point, while severe and long continued gales of wind from south and south-west, accompanied with constant mists and thick fogs, prevailed. Catarrhal complaints became very prevalent, and a general inflammatory diathesis was apparent throughout the hospital ; but what more than all convinced us of the change of type, and pressed on our consideration the propriety of blood-letting, was, that the spontaneous hemorrhages, which formerly sunk the patient's strength, were now accompanied with obvious relief. The greatest caution was therefore used in the administration of wine and opium ; the dose of the latter, which, in some of the more severe cases, had been extended to three and four grains in twenty-four hours, was now gradually diminished to a bare anodyne at night, and the wine was changed from Port to Vin du Pays, with a diminution also of its quantity ; while spirits, which had occasionally been allowed, were entirely prohibited. In short, a moderately antiphlogistic regimen was universally adopted.

A favourable case for venesection at length presented itself ; the result was strikingly advantageous, and the practice became general ; indeed, the very patients themselves implored the use of the lancet, and from that period to March following we used no other remedy, either as a cure or preventive. If it was neglected on the appearance of an inflamed ring around a sore, attended with violent throbbing pain, and a foul bottom smeared



with unhealthy pus ; or, if, in a suspicious stump already healed, redness, pain, tension, and bounding pulse occurred, gangrene assuredly took place, if full and early blood-letting was not employed. Much to our surprise, we never observed any of the lancet wounds assume a gangrenous appearance, although previously in almost every other instance the slightest puncture festered.

In the local treatment, a great variety of methods was pursued ; an enumeration of them would embrace almost all that have been proposed by authors ; with the exception of the actual cautery, which has acquired great reputation in France, both in this disease and in tetanus. There exists, however, so strong a prejudice against it, that I hesitated much to encourage its adoption in the British hospitals. Some applications, which agreed for a day or two, became either inert, or hurtful at the end of that period, and we were at length guided in their use by the effect which they seemed to produce. In general, however, the sores were covered with a large fermenting poultice ; and if there were great tension and inflammation of the limb, cloths dipped in saturnine solutions were applied. The more irritable sores were dressed with lint moistened with tinct. opii, or camphor dissolved in oil, or a paste of camphor and opium ; where the fetor was very great, levigated charcoal, either alone, or mixed with bark, or camphor, was employed. An application, also, from

which we derived some assistance, was diluted nitric, or citric acid.

The French surgeons, some of whom did duty with us, used to apply hot fomentations of walnut leaves to the sores, and then sprinkle them with powdered Nitrat of Silver ; but I observed no better effects from this than from any other external application ; and, indeed, I never observed decidedly bad consequences from any, except hot burning oils and nitre, the application of which, particularly of the latter, produced the most exquisite torture, without any corresponding advantage. Whatever dressings were employed, the utmost attention was paid to the removal of all filth, by repeated washing with tepid water. The sores, during the whole time of dressing, were exposed to the fumes of nitrous acid gas, which was also constantly diffused through the wards. The walls, roof, and floors of the sloughing wards, were daily white-washed, the same cloth or bandage was never used a second time without washing ; and the sponge or tow (which is much preferable) employed in cleaning the sores, an operation generally performed two or three times in the twenty-four hours, was immediately destroyed, to prevent all chance of inoculation, which, in a large hospital, is frequently effected in spite of the best precautions.

When our endeavours began to be attended with success, the febrile symptoms began also to abate, and small florid specks, about the fifth or

seventh day, appeared to break through the black sloughs, the edges of the circle lost their retorted and tumid appearance, and the looks and spirits of the poor sufferers considerably improved. The slough soon began to loosen, and, at this stage, I think, the use of powdered rhubarb externally was attended with beneficial effect, and assisted much in cleansing the sores. In some cases, however, the sloughs were amazingly tenacious, and required a strong solution of lunar caustic. (In those cases the diluted Fowler's solution of arsenic, looked upon as a specific escharotic by some, will be found very serviceable in cleansing the sores ; but, whatever is used, no violence should be employed.) A much more important object than the separation of the slough, was the removal of the patient to an airy and separate ward, as no disease was more apt to recur than this. I have seen a case, in which, in spite of our utmost endeavours, the wretched patient suffered thirteen different relapses, and at last sunk under the violence of the repeated attacks. These occurred from the slightest local irritation, or error of diet, and sometimes without any apparent cause whatever, and at a period when cicatrization was rapidly going on. They also at times occurred without any increase of fever ; a small livid, or red spot, covered with a glairy tenacious purulent matter, suddenly making its appearance, and, however frequently destroyed, still continuing to increase, until at last the whole sore again assumed the sloughing state.

Hæmorrhage frequently occurred about the period of the separation of the sloughs ; it was best restrained by pressure with a sponge, or compress, dipped in oleum terebinthinæ. When the main artery gave way, amputation, as high up as possible, was our only chance of saving life ; indeed, this dreadful alternative was, in a great majority of cases, rendered indispensable, not from hæmorrhage alone, but from the extensive loss of substance occasioning destruction of the joints, and from other sequelæ of the gangrene.

The question of amputation, though a subject of much discussion in cases of common gangrene, could, in the hospital gangrene that I have been describing, admit of no hesitation. For, although the line of separation neither need, or ought to be waited for, in several cases of the former description, yet the phenomena of the disease, and the appearances on dissection, forcibly impressed the impropriety of attempting to operate before the fever had abated, and the sloughs began naturally to detach themselves. To give amputation every possible chance of success, separation was indispensable : the skin was detached as little as possible from the muscles, and the bleeding from the smaller vessels was restrained by pressure, and dossils of lint dipped in ol. terebinth. while the ligature on the larger trunks was applied as described already, by cutting short both its ends. \*

\* Dr Forbes witnessed, with the utmost anxiety, the whole progress of this epidemic, and Staff-surgeon Boggie, and Messrs



On one occasion, I have seen chronic gangrene prevalent in a military hospital, but it was at its termination, and when it had ceased to be infectious. Twelve subjects were handed over to me by the late Staff-surgeon Bell, at Abrantes, in September 1812, reported to have had the disease very violently, and it was said to have carried off vast numbers previously. The hospital was situated upon the southern, or Alemtejo bank of the Tagus, in a low, flat, moist, olive-ground, occasionally overflowed by the river. In its neighbourhood was the great commissariat depôt, where vast quantities of cattle were daily slaughtered, and where, from the number of carts, oxen, and mules hourly traversing the adjacent fields, the soil, intermixed with their food and ordure, and occasionally with damaged biscuit, was trodden down into a thick, tenacious, offensive compost, on which a burning sun acted almost constantly. On the northern bank, the hill on which the town of Abrantes was built, rose to a considerable height, and intercepted the currents of the winds, forming, by following the natural bend of the river, nearly a quarter circle round the hospital grounds. This stagnation of air was most obvious in the morning, when the inhabitants of Rosçio (as the little village was called) were enveloped in palpable fog, which was seen rolling languidly

Hume, Crofton, Fenton, and Dethick, were unremitting in their attentions.



along the plain, by the inhabitants of the higher ground. The sick were here, for the most part, accommodated in tents during the short time of their stay ; for it was principally a passing station, to collect them from the southern line of hospitals, and forward them to Santarem and Lisbon by water. The natives were universally affected with remittents and obstinate intermittents in the autumnal months, and their general sickly aspect sufficiently betrayed the unhealthiness of the situation. All the subjects of the hospital gangrene had either remittent or intermittent fever, complicated with dysentery, which they had brought with them, or contracted in camp. The sores had been originally wounds, but when I saw them they had no regularly defined shape or figure, but had precisely what Mr Bell notices, “ the appearance of a half putrid neglected limb, lying on a dissecting table.” The mode of cure I adopted, and which my predecessor had instituted, was as follows :—After putting the patients into separate tents, cleaning their wounds and persons, destroying all the former dressings, and removing every thing to which the slightest suspicion of being imbibed with the poison could attach, I administered the bark, with large doses of opium, camphor, and ammonia, and a liberal allowance of wine and nutriment. The parts were covered with powdered charcoal, and over that a fermenting poultice ; the dressing was confided to an able assistant, Mr Goodrich, now of the 6th infantry, and no hospital

servant was ever allowed even to touch the dressings during the application of which the gases from nitre and common salt were extricated by the usual means. Under this treatment, those cases improved ; and, although shortly afterwards the system of separation was changed, and syphilis, dysentery, and gangrene, were brought under one roof, the contagion did not spread, and I lost only three of those very unpromising patients.

At Brussels, the few suspicious cases that occurred at the Jesuit's Hospital, the highest situated and best aired of any establishment in that city, and which came under my charge, all terminated successfully, by separation, the application of the carrot poultice, free venesection in the commencement, and steady purging afterwards. It principally affected robust and dissipated subjects, sent in from the convalescent hospital or from quarters in the town, and presented the circular sore, with the accompanying fever of the inflammatory type. Any cases that originated in the hospital were from the lowest and worst aired wards, and those where the patients lay on low hospital stretchers.

In another hospital at Brussels, the Gensdarmierie, which lay very low, and had been originally a sort of police barracks, filthy in the extreme before its occupation as an hospital, and, from the circumstance of its having been the last establishment which had been opened, filled with prisoners of war, the dispersed remains of the various actions, who could not be moved off the ground by the

ordinary means, incapable of assisting themselves, and depressed and maddened by defeat : \* the gangrene showed itself by a most rapidly spreading and destructive sloughing of the stumps, of the true circular form; with a deep red border all round, acutely painful, and accompanied with violent fever, which commenced with shivering, succeeded by a hot stage, but seldom followed up by sweating. The skin was dry and parched, the tongue foul and loaded with a yellowish sordes, the pulse hard, full, and bounding ; the bowels universally constipated ; occasionally severe pain in the head, and in some instances delirium. The fever was constantly present with the sloughing. I have reason to suppose that the sloughing in some cases preceded the fever ; but in all the others, as nearly as could be traced by attentive inspection of the sores,

\* Three hundred men were collected in this hospital, the majority desperately, not to say incurably, wounded. Among them were *one hundred and forty compound fractures*, viz. 86 of the thigh, 48 of the leg, and 6 of the arm. They had been collected all over the country by the peasantry, and dragged from barn to barn, often without food or dressings, and did not arrive at Brussels until various periods, from the 8th to the 13th day after they were wounded ! It must have been to some of these men recently brought in, that Mr Charles Bell alludes at p. 319 of his Quarterly Report, Part III., where he describes the state of a wound "*fourteen days after its infliction when nothing has been done.*" Assuredly no body of men ever laboured harder in the cause of humanity than the British surgeons after the battle of Waterloo.

particularly some weeks after the establishment of the hospital, both appeared at the same time. In eight or ten days the violence of the fever abated ; but often for three weeks it continued to harass the patients, though less violent in its effects. An emetic and purgatives at the commencement generally relieved all the symptoms ; the cases were separated as speedily as possible on the first appearance of the complaint, and the state of the bowels was particularly looked to throughout its duration ; a variety of local remedies were tried, but no decided advantage accrued from any so long as the febrile symptoms continued unabated. A favourite external application was a liniment composed of equal parts of balsam of copaiba and tincture of myrrh ; it seemed on its first application to sooth the pain ; poultices, from their weight and the uneasiness they occasioned, were early discontinued.

In the Elizabeth Hospital at Brussels, a building which lay low, but was clean and well ventilated, some cases of gangrene appeared, but originally and principally in the lowest wards. The sloughing was almost universally preceded by fever, and the remedies employed were the diluted nitric acid and poultices externally, with purgatives, and occasional emetics.

In an hospital in the neighbourhood of Brussels, situated at about two miles from the city, on a swampy flat covered with trees, through which the



great Antwerp canal was cut, and the Dyle and several tributary branches crept along, the Brunswickers had their hospital establishment. Their wounded lay on the floors, and were much crowded. Gangrene raged there ; it frequently seized a stump three hours after amputation, and, when I visited that hospital, twenty-eight days after the battle, one solitary survivor alone marked the performance of a successful amputation. Bark internally, and external stimulants, appeared to have been the plan of treatment adopted. The nature of the accompanying fever was typhoid.

The practical conclusion which I would draw from all that I have seen or heard of this formidable disease is, that although, by discriminating the type of the accompanying fever, we may arrest the progress of the disease, or although a modification of gangrene (which has occurred to others) should arise, in which local remedies alone, or with very little constitutional assistance, as a purge or emetic, are sufficient to put a period to its progress ; yet that many valuable lives may be sacrificed before the propriety of these means, whether general or local, are satisfactorily confirmed ; and that it is therefore a duty of the most urgent kind, at once to break up an establishment where any suspicious sores may occur. In civil life, a multiplicity of causes may tend to obstruct this measure, but in military hospitals no such objections can possibly prevail. Tents, huts, and other temporary accommodations, which the experience of a



campaign sufficiently points out, are always within our reach.—Before dismissing the subject of hospital gangrene, I may observe, that by an analysis of the air in wards affected with this contagion, M. Brugmans has clearly ascertained that there exists in it a peculiar animal matter highly disposed to putrefaction, that the oxygen gas is considerably diminished, and the azote and carbonic acid gas augmented; and that by the tests of nitrate of silver, acetate of lead, and oxygenated muriatic acid gas, the presence of sulphuretted hydrogen gas is detected. See his most interesting paper, “*De l’Etat et de la Composition de l’Atmosphere,*” *Annales de Literature, &c.* Vol. XIX. par MM. Kluyskens et Kesteloot.

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### OF MORTIFICATION.

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ANOTHER morbid state, which very frequently accompanies those accidents so peculiarly the object of the military surgeon’s attention, is the gangrene or mortification to which all gunshot wounds are inclined more or less, and which is unconnected with contagion. My object is not at present to enter into the general history of gangrene, which is well understood, but merely to state the question respecting the practice to be followed in cases where the removal of a limb becomes the object. The line of separation has long and universally been regarded as exclu-

sively leading to the formation of a correct opinion of the particular spot to be operated upon, and the precise period to attempt the operation : and where mortification has been produced from causes existing only in the constitution, or where, by sympathy, it has been originally led to suffer, and has at last become completely implicated, we can have no better guide. Could we set bounds to this constitutional affection, and prevent it from degenerating into an action by which the safety of the whole system is threatened, we need never seek any other ; but, unfortunately, we too frequently meet with cases, and particularly in military surgery, where this saving constitutional effort is never made, or not made until too late, and where to wait for it, is therefore to expose the patient to certain death.

The division of mortification into traumatic and spontaneous, as laid down by M. Larrey,\* is one of great practical importance ; it has been deduced from long and attentive observation ; it is consistent with what the practice of every military surgeon must have suggested, and it fully justifies the adoption of the rule of conduct announced by him, viz. “ that when mortification is the result of a mechanical cause, and puts the patient’s life in danger, we need not wait until the disorder has ceased to spread.”

\* Mémoires de Chirurgie Militaire, Tom. iii. p. 142. *et sequent.* Vide also Guthrie on Amputation, p. 63.

By the adoption of amputation upon the field, or as soon after as possible, the cases of this nature will be much diminished in number ; but still occasional instances will occur, where to wait for the line of separation is to risk the life of the patient.

The practice has been frequently followed by British surgeons of both the naval and military services, and their testimonies in its favour are the more valuable, that they have been given, not in support of any favourite plan or theory, or in the quality of institutors of a new system, or promulgators of a new discovery, but simply as the result of their own practical experience. I cannot omit quoting the testimony of one of them on this subject,—a subject, for the introduction of which to the notice of army surgeons, in a special dissertation, we are exclusively, I believe, obliged to M. Larrey, and to the justice of whose remarks the dispersed and insulated observations of others, both before and since his publication, will bear ample evidence. In a work which appeared in 1807, giving an account of the practice adopted so far back as 1782, by Mr Curtis, a naval surgeon, some very satisfactory observations occur on this point.\* “Some patients,” he observes, (p. 229,) “with spreading gangrenous sores of the legs and feet, were probably lost from an idea that was entertained that gangrene

\* An Account of the Diseases of India, as they appeared in the English fleet, and in the Naval Hospital at Madras, &c. 8vo, Edin. 1807.

and mortification depends always on a disease of the system, and on a morbid condition of the solids and fluids, which must be corrected before any operation can succeed. And it must be confessed, that the directions in books of surgery generally run in this way, at least they commonly direct that we should wait till nature makes an attempt to separate the dead from the living parts ; but this opinion, so far at least as affects Indian practice, and the hospital gangrene of that country, is not well founded, nor, perhaps, with respect to such mortification as is the immediate consequence of external injury in general.”

Mr Curtis then gives a case of amputation after fracture near the ankle joint from the fall of a mast, which, though unsuccessful, is valuable on two accounts; first, that the gangrene which led to the operation did not spread to the stump ; and, secondly, that the dissection, though brief, demonstrates the improved state of the parts, and the actual removal of some of the diseased appearances. The symptoms which preceded death, in this case, had evidently no analogy to those arising from gangrene, but the dissection is still more clear. “ On inspecting the stump immediately after death, the swelling of the thigh was so much reduced as to loosen all the bandages ; a fine supuration was beginning to appear, and the skin laid over it was adhering ; the ecchymosis left above the incision at one spot was now quite gone

off, and the skin had returned to its natural colour." This gentleman also adopted the plan as preventive of hectic fever or putrid absorption, and he gives one instance where it was successfully performed while gangrene was rapidly spreading from improper bandaging.

I met some years ago with a case very similar to this; the injury was effected by repeated and severe blows of a stone, producing no less than three distinct fractures of both bones of the forearm; mortification set in, and, without waiting for any line of separation, I removed the limb, and the stump nearly healed by the first intention. My friend, Deputy-Inspector Pitcairn, of the Irish staff, favoured me with his assistance on this occasion. I had also, in some instances, operated after gunshot injuries before I saw M. Larrey's book. Emboldened by his observations, and following his rules, I have since repeatedly done so without waiting for the line of separation; and although I certainly was not uniformly successful, I have no reason to imagine that death was occasioned by a departure from the rule so generally laid down by authors.

Among the great number who have written upon gangrene, many valuable observations are to be found. Kirkland and Sharp in England, and O'Halloran in the sister island, have dedicated a part of their labours to the investigation. In Mr Hunter's invaluable work on inflammation, every



line of which is of importance, much interesting matter will be found. But, perhaps, we owe to France the most perfect account that has ever appeared. I allude to the “*Traité de la Gangrene*” of Quesnay. Many scattered notices, together with the majority of the special treatises on the subject, have been analyzed by Dr Thomson, and their matter condensed in his *Lectures on Inflammation*, under the head “*Mortification*.”

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### TETANUS,

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THE last and most fatal affection incident to wounded soldiers is Tetanus. Happy should I be could I afford any thing satisfactory on this dreadful complaint ; but, in truth, my observations have tended more to show me what I could *not* trust to, than what I could place the smallest reliance on, when the disease was once fully formed. Was it my object to offer plausible theories or unsupported conjectures, I could with ease accumulate references to authors, both ancient and cotemporary, but it must be confessed, notwithstanding all that has at various times been written on the subject, that we have not arrived at any certain con-

clusions, nor perhaps have we yet fallen upon the path of investigation which is to lead us to them. The theories of the disease, and the remedies proposed for its cure, are numerous; and while the opposite natures of the latter will at once lead an unprejudiced judge to hesitate as to their value, the candid avowals of almost every surgeon's conscience will confirm their inefficacy. The facts, the deductions from them, and the remedies employed in consequence, all require arrangement; and it may still occupy years of impartial investigation, and of minute inquiries in morbid anatomy, before we can be able to emerge from our splendid poverty, and from the apparent multitude of our stores select a few of sufficient value, on which to found a solid structure of practical utility.

I have never been fortunate enough to cure a case of the Acute Symptomatic Tetanus; in some instances of the Chronic species I have effected or witnessed relief. I shall not take up the reader's time by detailing my disappointments: they embrace almost, if not altogether, every remedy that has come within the knowledge of practitioners. It will be seen by a reference to Sir James M'Grigor's paper, in the sixth volume of the Medico-Chirurgical Transactions upon the diseases of the army in Spain, how little dependence could be placed upon any of the remedies employed in the disease; and what I shall briefly state, upon my own evidence, will, I fear, tend in no degree to

enhance our confidence in their general usefulness, or their applicability.

In one instance, I have known a cure effected by the inunction of the unguent. hydrargyri; but after several weeks of its use the patient expired of mercurial marasmus. In another, amputation of the wounded limb relieved all the symptoms, but the patient died of a fever, which hung upon him during the whole period of the complaint, and carried him off in the sixth week. In my last case, venesection, and the use of the tobacco injection, (which brought away enormous quantities of hardened fæces,) after five days perseverance relieved all the symptoms, and the employment of æther, and the tincture of opium in frequent small doses, removed the occasional spasms that occurred, the bowels being carefully watched. The disease lasted for seven weeks. But in another case, precisely similar, treated in the same ward, at the same time, on the same plan, and by the same medical assistant, the usual termination occurred on the 15th day.

The period of invasion, and of the time which may elapse before an immunity from attack can be with confidence looked for, are quite uncertain; and it is a fact not a little curious, that patients, under similar circumstances, in every respect, of age, diet, nature, and period of infliction of wounds and accommodation for their cure, shall become liable to it in one hospital or district of a town,

and be free from it in another. This was very obvious after the battle of Thoulouse. Passion or terror after wounds and operations has been known to produce the disease in some ; and sympathy, though a rare cause, has occasionally given rise to it in others.

In this disease, at least, the warmest advocates for the sanative powers of nature have nothing to bring forward in favour of spontaneous cure. One case is alluded to by a recent French writer, \* but without throwing much light upon the subject ; indeed, nature seems to be very much at variance with herself in many points connected with this dreadful interruption to her economy. Exposure to different temperatures appears equally to predispose to it, and the various forms of the disease are produced indiscriminately by similar causes. Although the *Emprosthotonos* is an occurrence so rare, that I have only seen one case which approached to it, yet that case was observed at the same time, and in the same hospital, with the various degrees of trismus, rigid spasms of almost every muscle of the body, and violent periodical convulsions, all from similar injuries to that in which it was produced. From the state of the pulse, I have derived no clue to either the proper treatment or the probable event. It has, in the cases I have met with, been astonishingly unaffected-

\* Briot, Histoire de l'Etat et de progres de la Chirurgie Militaire en France, pendant les guerres de la Revolution. 8vo. Besançon, 1817.

ed. From the state of the skin, I have been left equally in the dark. Sweating, which some have imagined critical, I have seen excessive during the whole course of the disease, and attended with a most pungent and peculiar smell, while in others it has never appeared at all ; and suppuration, which is generally interrupted, I have seen continue unaffected by the spasms. Even the process of healing, which, it would be reasonable to conclude, would be altogether put a stop to, has gone on apparently uninfluenced by the disease ; and in the most severe case I ever saw, which occurred after a shoulder-joint amputation, sent in to Elvas from before the lines of Badajos, the life of the patient and the perfect healing of the wound were terminated on the same day. I have, in short, observed no symptom, among the great numbers detailed by writers on this disease, invariably present, except obstinate costiveness. Neither are the species of injuries which produce the disease uniform in their effects. Wounds below the elbow and knee have been those which I have seen most frequently followed by it, but by no means to the exclusion of injuries nearer the trunk, of the trunk itself, and of the head. In almost all the instances that I have seen, the patients have been exposed to a stream of air directly blowing upon them ; this has been sometimes cold, and at others of a high temperature.

In the dissections which I have made of cases



of this disease, I have been much disappointed. I never found any peculiar appearance of the wounds themselves except in one, where the radial nerve was somewhat thickened, and a small splinter of bone was sticking in it ; the man lived six weeks : and one where, after amputation of the fore arm very high up, I found the muscles a good deal injected with a serous effusion, and an effusion of the same kind surrounding the vessels ; the nerve, which I suspected had been included in the ligature, seemed perfectly sound, but the vein was ulcerated for two inches from the ligature, and its coats thickened to nearly the extent of a quarter of an inch, the inflammation spreading on to the heart. This man, who was treated by a German surgeon, was seized on the 5th day from the amputation, and bled very copiously ; he died on the 8th. The dissection, which was performed by my friends Mr Crofton and Mr Dobson, was extremely embarrassed by a thick crust of bark, which surrounded the wound, and penetrated into and stained all the parts in the vicinity.

I have never been able to trace the peculiar appearance and effervescence of the intestinal contents, as mentioned by M. Larrey, repeated by his English translator Mr Waller, and confirmed by my friend Dr Dickson ; nor any other peculiarity which did not appear to me to be fairly attributable to the remedies used, and any inflamed or lacerated appearances on the stomach or abdominal

muscles, the fauces, larynx, &c. which are frequently observable, appeared to have been more from the effects of an increased flow of blood to them consequent on their increased action, than from any other cause.

Among the great mass of authorities on this point, I would strongly recommend to the perusal of the junior army surgeons the *Mémoires* of M. Larrey, the *Observations* of Mr Abernethy, the paper of Dr Dickson in the 2d part of 7th Vol. of the *Medico-Chirurgical Transactions*; the *Cases* of Dr Parry, Bath, 1814, and a small probationary *Surgical Essay* by Dr Maclagan, Physician to the Forces, Edinburgh, 1816, which contains an interesting summary of our present knowledge upon this subject.

The host of authors referred to by Ploucquet, and indeed all other authorities upon tetanus, lose much of their interest if unaccompanied by dissections. Some recent occurrences, and particularly a case detailed by my friend Mr Webster, surgeon of the 51st regiment, in the *Medico-Chirurgical Journal* for October 1817, have determined me to lose no opportunity of minutely examining the spinal cord and the theca vertebralis, in all future cases of acute tetanus, or of a disease in many points very analogous to it, hydrophobia:—a determination, in which I am strengthened by the opinion of the author of the excellent paper in the *Medico-Chirurgical Transactions*, above referred to; and, as a remedy, I am strongly inclined to favour the

employment of digitalis, which I know from good authority to have been recently employed with considerable success.

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### AMPUTATION.

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It is an excellent observation, founded in the purest humanity, and justified by the soundest professional principles, that to save one limb is infinitely more honourable to the surgeon than to have performed numerous amputations, however successful ; but it is a remark, notwithstanding its quaintness, fully as true, that it is much better for a man “ to live with three limbs than to die with four.” How many wretches have dragged on a miserable existence, trailing after them a deformed, irritable, useless leg, or vainly attempting to wield an inert, contracted, and cumbrous arm, may be estimated by a perusal of the work of the Prussian advocate for those distorted masses of disease, in which, even from his own words, it is obvious that M. Bilguer inflicted a tenfold proportion of pain, and exposed his patients to an incalculably greater degree of danger than if he had removed their limbs at once. Fortunately for the contending armies of modern times, this specious inhuman-

ity has now nearly passed away ; surgeons no longer hesitate, and even patients appreciate their motives justly, and attribute the loss of their limbs to the fire of their enemies rather than to the incision knife of their friends. This very confidence increases the natural desire of a conscientious man to save his patient's limb, and he will persevere in his endeavours until further forbearance would degenerate into criminality.

The circumstances which lead to consecutive amputation are very numerous ; and the influence of existing or preceding disease, natural or acquired irritability, the differences of season, climate, and food, but, above all, the crowded state of the sedentary hospitals, will, at an earlier or later period, fix the time of operation. For the precise moment, no definite limits can be laid down, but the judgment of the surgeon must alone be his guide, and this judgment can be acquired solely from a perusal of the volume of nature, and the impressive instructions to be gained in the clinical wards, by a diligent attendance on disease, and becoming acquainted even with its physiognomy. The most superficial perusal of surgical works will point out the differences of opinion which exist as to the propriety of operation, between those who have practised among robust peasants and in the smaller establishments, and those whose patients have been taken from among artizans and inhabitants of large manufacturing towns and cities, or treated in large,



confined, and ill-aired hospitals. The military surgeon anticipates all the consequences of delayed operation, not only from the particular effects it may have upon individuals, but the great influence which protracted suppurations, hemorrhages, diarrhœas, febrile exacerbations, and hectic sweatings, must have upon those who live within an atmosphere constantly impregnated with the effluvia arising from patients suffering under them. To lessen an evil which we cannot altogether avoid, we must lose no time in effectually preventing that deterioration of the hospital atmosphere, which these diseased processes so materially contribute to. On the very day that a subsidence of fever is effectually announced by a free and healthy suppuration ; by the abatement of local inflammation ; by a restoration of the skin to its functions, demonstrated by returning coolness and elasticity, particularly on the affected limb, we should proceed to perform our amputation on those patients in whom no hope of an ultimate recovery without it, can be entertained. We thus do them the strictest justice, and we hold out to the cases reserved for trial the greatest possible chance of recovery. To prepare them for this state, much may be done by attention to their bowels ; costiveness is a source of great irritation, and not an unfrequent cause of the commencement of the diarrhœas which so often hurry off those poor sufferers. Dryness of the skin, and febrile heat, often de-



pend on this state of the bowels, and a relaxation of one is best promoted by producing that state in the other. The day before an operation, the administration of a purgative is very important; serious inconveniences, and among them, hemorrhage, are frequently owing to the irritation and repeated strainings to stool, occasioned by costiveness. I scarcely recollect a situation in which bleeding vessels occur more frequently than in the act of passing accumulated fæces after an amputation, particularly of the lower extremity.

But the grand source of safety to the individual, is removal to a distant and separate ward, and, if possible, to another hospital appropriated to the cases operated upon, as soon as his removal is at all practicable. To those who have not had experience on this point, it may appear a very useless, if not a very injurious measure, thus to remove the stump patients; but I hold it as one of the best established facts in military surgery, that a cautious and well regulated shifting of those cases from the hospitals, or, if possible, the towns in which they have been established, is one of the most certain means of insuring their ultimate recovery. I have witnessed hundreds of cases in confirmation of this; I have seen the men, who, on the first day of a transfer from one hospital to another, have been obliged to be assisted into the boats or waggons, or held on mules; enjoy a sound night's repose, awake with a craving appetite,

have a free copious and natural alvine discharge, and proceed on rapidly towards a convalescence or a cure, which has been only interrupted by their arrival at an hospital station. When I reflect, on the other hand, on the poor sallow dejected beings that have pined in the hospitals; the flabby non-adhering inanimate stumps, lined with a discoloured half digested sanies, which have disappointed my most sanguine hopes—I shudder at the contrast. \*

If the effects of Gestation have been such as I have now described, when circumstances called for an evacuation of the different hospitals, one upon another, and where the movement was dependent, in a great measure, upon casual transport over execrable roads, and with bad accommodation of every kind; what must it be, if this moveable hospital had its own appropriate mode of transport, bedding, stores, and provisions, with proper servants, and medical attendants, on selected roads, and with

\* On this highly important subject, *vide* Jackson's Outline of the History and Cure of Fever, 1798, p. 287. Jackson's Constitution of the Medical Department of the Army, 1803, p. 296. Dr Wake's *Dissertatio Medica Inauguralis de Typhi Remediis*, Edinburgh, June 1807; and Dr Woolaston's Croonian Lecture, extracted from the *Philosophical Transactions* in *Edin. Med. and Surg. Journal*, Vol. VII. p. 58. But the most interesting observations to an army surgeon, upon this subject, will be found in Larrey's *Mémoires*, Vol. III. p. 38. *et sequent.*

sufficient hospital accommodation? Without being enthusiastic, or even sanguine, I may be allowed to anticipate most favourable results, and to press such an establishment upon the consideration of those in command. The spare forage waggons of the army might easily be made available for this purpose, and a few hours exercise might be daily given to the wounded; and, under favourable circumstances, they might be kept in movement within a small circle for several days, encamping at night, and leaving all their filth behind them, while, in the interim, purification of the different hospitals was effecting in succession.

But, to return.—This first class of consecutive operations having been performed, and the subjects of them removed, our unembarrassed attention can be turned to the cases for trial. Of these, the joint cases and the compound fractures are the principal. Mr Hunter, among the numberless valuable facts which he has pressed upon our attention, points out the much greater danger in the injuries of parts far from the source of circulation, than when near it, even when these parts are similar both in texture and use, as in the extremities. Military surgeons are now in the habit of dividing injuries into those affecting the two articulating extremities of a bone and its middle portion, which is again subdivided into three parts; but the observation of Hunter, so just as applied to the entire limb, does not hold in the

parts; for, in the thigh, the injuries of its head and neck are, beyond comparison more dangerous than those of any other part; next, those towards the middle of the bone, proceeding downwards; then the articulating extremity at the knee; and, lastly, the portion from the condyles to the centre of the bone upwards. In the legs, on the contrary, the injuries of the tibia, near the ankle joint, are much more dangerous than those immediately below the knee, supposing the joint not to be implicated; and, in the arm, many injuries of the head of the bone, and its vicinity, may be got over with due attention, while those at the elbow-joint most commonly lead to the loss of the limb. In the fore-arm, again, the order of safety becomes reversed, and the injuries near the carpal articulation are less dangerous than those near the humeral. In all cases, the injury from a musket ball is less than from grape-shot, and in those less than from round. The state of the soft parts also must be taken seriously into consideration, particularly the blood-vessels. From deliberately weighing all these circumstances, together with the peculiar constitution of the patient, and the general healthy state of the hospital, our period of secondary amputation must be determined. In some hospitals, and at certain periods, no operation succeeds well. In some subjects, also, the constitution seems to have lost all its energies; the parts may be retained in apposition



by straps and bandages, but their approximation is mechanical, and not seconded by any healthful effort of nature, while men in the same ward recover fast; obviously demonstrating that localities have no influence on them, although it must be confessed, that generally, when one sore goes wrong, great numbers follow the example. Removal, then, affords the only security for success.

Could we always follow our own wishes, as we sometimes may in the case of officers, or insulated individuals, we would defer amputation until fever of every kind and degree was subdued. This is out of the question in a large military hospital. Where we are at all liable to contagion, we must content ourselves with moderating instead of removing febrile affections. Had a surgeon his choice, he would perhaps wait for an amendment in the sharp, quick, small pulse of hectic, a restoration of appetite, a regularity of the bowels, and a diminution of the sweating tendency, and of the cough. But it is most satisfactory to know, that the removal of the local injury often rapidly affects the mitigation of those sympathetic consequences.

I have very little to add to the numerous excellent works on the operative part of this subject; but as I think I have derived much benefit from attention to a few simple particulars, I shall briefly state them.

First, where the tourniquet is used to com-



mand the flow of blood, I would advise, that whatever confidence we may have in our assistants, or those around us, the application of this instrument should never be entrusted to any individual ; nor should we proceed to operate until we have personally ascertained our perfect command of the circulation. Secondly, where the circulation is to be commanded by the pressure from the hand of an assistant, particularly in the operation at the shoulder-joint, there is not only no necessity for the application of the key, boot-hook, or tourniquet handle, usually employed previous to beginning the operation ; but it is actually hurtful. The long-continued pressure is excruciating to the patient, and is often more the subject of his complaint than any other step of the business ; it is also particularly fatiguing to the assistant, who, by this means, begins to flag at the moment his strength and dexterity are most wanting. Pott well knew the advantages of husbanding the strength of his assistants, (indeed what of practical utility did he not know ?) and thought it not unworthy to remark upon their tired state ;\* but in the operation I am speaking of, the assistant has by far the most serious part of it to manage ; and if his management is proper, a more bloodless one, for its magnitude, is not in surgery. I abstain from all comment upon the opinion of Mr John

\* Remarks on Fractures and Dislocations.

Bell upon the subject of commanding the subclavian artery ; neither is it my object to enter into a competition of sarcasm with those who make this exhausted subject a vehicle of groundless insinuations against the military surgeons. The point is incontrovertibly settled ; the vessel can be compressed as it runs over the first rib with the greatest certainty, and, by an expert assistant, with the utmost ease. I have performed the operation seven times,—twice out of the number by candle light ; I have been the compressor of the artery repeatedly ; and I have been witness to its being commanded on numerous occasions ; but I have never seen the most remote approach to dangerous hemorrhage. \* When a large majority of the British hospital staff operated in concert for several successive days at Vittoria, the loss of a wine glassful of arterial blood, when this operation has been performed, has been an unusual occurrence ; much oftener half the quantity ; and in one amputation performed upon an heroic soldier of the Chasseurs Britanniques by Staff-surgeon Dease, assisted by Staff-surgeon M'Lean and myself, the amount of arterial blood lost from the principal artery, was

\* I have not the least objection to the counter security of pressure in the axilla ; but if the patient is properly supported in a chair, or laid along on a table, which I much prefer, his yielding to the pressure over the rib is completely prevented. Vide Mr C. Bell's Quarterly Report, p. 226, Part II.

no more than the quantity contained between the point of pressure and the point of incision through the vessel. These operations were all performed before numerous spectators ; and I can assure my junior readers, that, without any peculiar dexterity, the same result is within their own attainment. Let the assistant first try his power of compression before the operation has commenced, and let him with his eye mark the precise spot well ; during the external incisions the pressure need not in the smallest degree approach to violence. When the surgeon is about to make his dismembering cut, or that which, in removing the bone from the socket, divides the artery, firm, steady, and even powerful pressure will be required for the fourth of a minute ; within that time the ligature should be secured on the vessel, for it almost always protrudes into the surgeon's fingers, and if it should not it cannot be mistaken, and the tenaculum will readily draw it forth ; articulating branches are soon secured, and I have never seen them troublesome if the pressure is correct. This operation was actually performed at an hospital in the town of Bilbao by a young hospital mate, on a very urgent occasion, with the assistance of an orderly man only ! This fact is curious ; but the following sacrifice of prejudice to vanity, which has come to my knowledge, is perhaps still more so : A strenuous protester against the efficacy of pressure performed

the operation with one hand, while he compressed the artery with the other!!

To perform the amputation at the shoulder joint, I have for some years exclusively employed the mode by a flap formed from the acromion to the centre of the axilla on each side by a gentle curve, first through the skin and cellular substance on the outside of the arm, then on the inner, so as to mark the flaps and guide the future strokes of the knife; then, with a middle sized amputating knife I cut nearly down to the bone on each side. I then, taking the pointed slip of deltoid, which remains attached to the acromion, lay it down quickly with a scalpel, so as to expose the head of the bone, which I now proceed to luxate; this is done with the greatest ease and certainty by throwing the shattered remains of the arm backward, and thus exposing the long head of the tendon of the biceps; by dividing this tendon, and running the scalpel fairly forward along the groove, its back lying in it as in a director, we are at once conducted into the joint. I have witnessed considerable difficulty in hitting the articulation by the omission of this simple step, which will be entirely avoided if it is adopted; and, indeed, will enable the surgeon to enter the joint blindfolded. By carrying the scalpel fairly round, the capsular ligament is divided from the bone. Resuming the amputating knife, with one sweep in the axilla the two lateral flaps are united, the limb removed,



and the flaps brought together with adhesive straps and bandage. This I have found the easiest and simplest mode of performing the amputation, although the dexterity of many of my brother surgeons in the Peninsula and on the Continent was so great, that almost every individual had a peculiar plan, and they finished their operations in as short a space of time as they would have required to describe the differences of their plans from those of others. \*

In whatever form we may be disposed to make our flap, we must be guided by the state of the soft parts. If, as very often happens, a round shot has grazed along the top and external parts of the shoulder, laying open the joint, there the flap, by laying back the deltoid, cannot possibly be made. If a musket ball, or a piece of shell has struck the centre of that muscle and penetrated to the joint, or comminuted the head and neck of the bone, it would be highly imprudent to make a flap of a wounded muscle, ever liable to sloughing. If the shot-holes are lateral, our semilunar incision may be so contrived as to pass through them and remove all lacerated parts; but if it cannot be so managed, and that they must necessarily remain in one or both our flaps, we must, with the finger and sponge, clear away all splinters, (with which

\* This plan may also be advantageously adopted where we mean only to remove the head of the bone.



I have sometimes found them full, as if they had been stuffed by art with coarsely pounded bone,) and bring them as nearly together as we can. Wherever the scapula and clavicle are involved, which generally implies an extensive destruction of the soft parts, after removing all splinters, the wound must be lightly dressed, and its future covering left to adhesive straps and bandage, which, if judiciously employed, will very soon effect this purpose without the use of ligatures or sutures. I have never met with a case where the removal of any part of the scapula by the saw, or even the paring of the cartilage of the glenoid cavity, was at all necessary, if extensive fracture of it did not exist.

If the head of the bone is the only part injured, or if the injury does not spread to any extent along the shaft, it certainly becomes the duty of the surgeon to attempt to save the limb. The following inquiries and considerations, however, appear to me well worthy of being seriously weighed before we proceed to remove the head of the bone. 1. That the splintering of the shaft of the bone may not be so extensive as to reach much beyond the point where a removal of its head could be useful; and here it is to be remarked, that experience almost universally shows that splintering, or splitting of the bone, extends downwards *towards the condyles* instead of towards the head, and the same holds good in the femur, and in the tibia. 2. That the head of the bone being

removed, the necrotic process may not go on lower down, in consequence of an inflamed state of the periosteum, injury of the medulla, or disease of the bone, from other causes not cognizable in the early period of the injury, and to whose progress no limits can *a priori* be assigned. 3. From those considerations, would it not be most prudent to let the removal of the head of the bone be always a *secondary* operation? Where splinters stick out from a wound in or close to the shoulder joint, or are loose, and within safe and easy reach, and the surgeon supposes the limb is not irretrievably injured, let them be removed, and the edges that might irritate be pared or sawed off; let the original inflammation and fever subside; and then, if the diseased state of the bone and soft parts becomes evidently defined in its extent, let the operation for sawing off the head and unsound parts of the bone be attempted.\* But where there is not perfect soundness of constitution to bear up against fever, formation of matter, and repeated exfoliations, life may often be lost in the attempt to save the limb.

The history of the hip-joint operation has been ably stated by Professor Thomson in his "Report;" and Messrs Larrey and Guthrie have detailed the necessary steps for its performance. I have

\* Vide a case by Deputy-Inspector Morell, Medico-Chirurgical Transactions, Vol. VII. p. 161.

myself, on two late occasions, performed amputation of the thigh so very high up, nearly embracing the trochanter, and consequently the capsular ligament of the joint, that a very few strokes of the scalpel would have effected the dislocation; more especially, if the head and neck of the bone had been split to pieces, as it very often is. My incision was the common circular one; and I did not, as I once before had done, make the taking up of the femoral artery a necessary preliminary measure; I tied the arteries in succession as they were cut, an able assistant pressing on that in the groin. In the last, I was favoured by the assistance of these excellent surgeons, Messrs Guthrie and Brownrigg, and the hemorrhage was not at all greater than when the tourniquet is applied higher up. In Mr Guthrie's hip-joint case, at Brussels, Staff-surgeon Collier and myself compressed the vessels, and the hemorrhage was very little more than in the common amputation with a tourniquet; indeed, the state of the vessels presented nothing difficult to the operator, whose coolness and dexterity were unrivalled.

In a hip-joint case operated upon by Mr Vance at Haslar, after a method analogous to the flap operation at the shoulder-joint, now so generally adopted, the loss of blood was altogether trifling; the greatest flow was from the separated limb; and, although the patient died some time afterwards, his death was totally unconnected with hemorrhage. Indeed, the deaths, as far as my inquiries have

gone, have been generally dependent upon other causes. The great violence of the injury itself which requires the operation, and the severe shock, are quite sufficient to account for the fatal events. In much less serious operations than that of hip-joint amputation, I have seen death occur on the moment, and that in men of the most determined courage, and without the smallest excess of hemorrhage. Upon the whole, I believe that we may as safely divest ourselves of all fears of hemorrhage in operations properly conducted on the lower extremities, as we now do on the upper.

An ingenious naval surgeon, Mr Veitch, has published a paper upon this operation, in which he proposes to make the first step of it in no respect different from the high circular one, except by leaving an inch or two of the bone projecting, which may be done without the slightest pain or trouble, by dissecting off the soft parts towards the knee, and sawing the bone low down. This projecting piece of bone, he proposes to use as a sort of lever, to assist in the complete dislocation of the head from the acetabulum, which he next proceeds to do, and which is certainly much accelerated by the removal of the unwieldy mass of limb, which was all but separated before the application of the saw. \* Were I called upon to perform the operation, I should certainly proceed

\* Edinburgh Med. and Surg. Journal, Vol. III. p. 129.



upon the principle of Mr Veitch in my first incision ; although I should promise myself little, if any assistance, from the part of the bone remaining in the socket, as, in the injuries requiring the operation, the bone is generally so shattered, as to possess little or no cohesion of parts, and consequently cannot be employed as a lever. I have seen the head and neck of the femur comminuted into portions, not much larger than a musket ball, the only adhering part being the fragment into which the round ligament was inserted, and, consequently, had an operation been attempted, the surgeon could not have availed himself of any guidance or assistance which might be afforded by the bone in a sound state.

In commencing an amputation below the joint, and particularly in a large lower limb, I would recommend placing the right hand under the limb, and carrying it to some extent round it, in the position meant to commence the incision, and then *dropping* the knife into it, instead of running the hand ready armed with the knife beneath the part. By neglecting this very simple preliminary measure, I have seen some most awkward scratches dealt out to the patient and assistants.

By cutting the first third, or nearly so, of the circle, principally with the heel of the knife, we shall always be enabled to complete the external incision with one sweep of the instrument, a matter of some relief to the patient in point of



pain, and of increased facility to the operator in forming a smooth even-edged line. In amputating, I have, in a great measure, followed Alanson's plan, and have given an oblique direction to all the incisions through the muscles, (the first having fairly divided the integuments and fascia,) as much upwards and inwards as possible. This saves a vast deal of dissection of teguments from the muscles, and is a powerful guard against leaving an overhanging and useless pouch of skin. If the incisions are made perpendicularly down towards the bone, a long dissection of skin is necessary; this is recommended and depicted in some of the modern systems of surgery, to an extent which I conceive entirely unnecessary under any circumstances, and which I know to be highly improper in most. In a small limb, I have repeatedly performed the operation with one sweep of the knife, cutting obliquely inwards and upwards, at once to the bone. The only objection that strikes me to operating in this mode is, that the arteries are sliced obliquely like a writing pen instead of being cut fairly across, and that if this is not kept in remembrance, secondary hemorrhage may take place after the vigour of circulation is restored, in consequence of the whole circumference of the vessel not being included in the ligature. By drawing the vessel fairly out, and placing the ligature beyond the commencement of the oblique cut, this accident will be effectually pre-

vented. In many subjects, however well the tourniquet may have been originally placed, we find a general oozing from the face of the incision, and sometimes the arteries themselves still discharging small jets of blood. When the discharge, from whatever cause, is large, and particularly in very weakly subjects, where a single jet of arterial blood is of vital consequence, I never hesitate in tying the vessels before proceeding any farther, giving the ends of the ligatures to an assistant until the bone is sawed through. This may, to some, appear a very *informal* proceeding; and I have heard it criticised as not being according to the rules of the schools; but a consideration of the safety of our patient should be our only direction, and in no particular should we sacrifice what the dictates of common sense and experience point out as necessary to ensure it, to the rigid formality of rules, or the pitiful pedantry of never deviating from them.\* On the same principle, we should never hesitate, if we find the bone much splintered, or diseased, or protruding after the limb is removed, or even if, by

\* Where the great veins bleed, I have never hesitated about tying them also, and it is most particularly necessary in debilitated subjects. I have met with only one case of venous hemorrhage to be fairly traced to contraction of the integuments, as observed by Mr Hey in his Chapter on Amputation; nor did it require an incision of the integuments, as practised by him, but was relieved by loosening the bandages, and moistening the dressings with cold water.

the retraction of the muscles, or of a false calculation of the necessary quantity to be left, a protrusion is probable, to take up the saw again and remove the necessary portion ; by doing it on the spot, much after pain and misery is avoided.

In the fore-arm almost every possible error of projecting bone or insufficient covering is effectually obviated by the flap operation. This is best performed with the fore-arm extended, the thumb and little finger in a perpendicular line, and forming the guiding points to the formation of two neat semilunar flaps, which are to be cut out either by the catlin from within outwards, or the middle-sized incision knife in the opposite direction.

Cases will occur where the hand or foot are only partially injured. By taking advantage of the joints and of the sound teguments, we very often succeed in saving the limb, and making a tolerable stump, by throwing the cicatrix out of the line of pressure ; but no general rule can be laid down for those cases, almost every one of which will require some peculiar management.

In putting up stumps, I have constantly practised the perpendicular cicatrix, supporting the parts after the application of the usual adhesive straps, with a band of plaster about three fingers' breadth, put moderately tight round the whole, so as gently but steadily to compress all the parts, particularly those that are concerned in the process of adhesion around the end of the stump ; and, to-

gether with the roller, to moderate or prevent muscular retraction. But if circumstances of diseased skin or muscle, wasting or distortion of the limb, accidental irregularities in the sawing of the bone, or intentional removal of a part of it, (as the spine of the tibia,) do not admit of the perpendicular line, I always place the lips of the wound in that position which most favours the perfect cushioning of the bone, without rigidly adhering to any particular line of cicatrix.

To perform amputation a second time, may appear a barbarous, and certainly is a very severe operation ; it sometimes, however, becomes necessary, from osteo-sarcoma, extensive necrosis, phagedæna, or great protrusion of bone, with an extensively diseased periosteum, where the powers of nature are inadequate to the cure. It must be confessed, that, although the former causes are often productive of this most unpleasant result, yet originally badly performed amputation, and subsequent improper dressing, have but too often a full share in occasioning the mischief.

The causes of death after amputation are various. Fever, whether symptomatic or endemic, and mortification seizing the stump, often cut off our patients. Sometimes the febrile affection is of a chronic nature, and soon degenerates into hectic, with cough, and every symptom of phthisis ; and often the patient sinks, as it were, at once arrested by the hand of death, without running through

any of the intermediate stages between the attack of disease and dissolution.

Dissection throws some light upon this interesting subject, and the results may be classed under the following heads:—1. Inflammation of the vessels. In some cases the veins, in others the arteries, and in others again both the veins and arteries, will be found inflamed, from the point of the stump to the very auricle or ventricle; and in many parts, either lined with coagulable lymph, or filled with purulent matter to various distances. In the dissections conducted by Messrs Dobson, Bingham, and Crofton, after the battle of Waterloo, we met with no less than twelve cases where the veins were inflamed, and where, at the same time, purulent matter was found in the arteries, with a considerable thickening of their coats. In one case, we found the brachial artery alone affected. For three inches from its cut extremity it was very much thickened and filled with pus. In another case, dissected by hospital assistant Dobson, the amputation had been performed low on the femur; death ensued on the 17th day. The artery was not diseased, but the vein was inflamed from the point of the stump to the very auricle, and of a very bright pink; when both iliac veins were taken from the body, the contrast was most remarkable; that on the sound side preserved its natural appearance, which, however, at the junction of the veins terminated abruptly, as it were by



a regular line. In those cases, although after the first discovery of inflamed vessels, they were closely watched, the symptoms were not of such a high inflammatory nature, as to demand bleeding to any great extent ; and in some, symptoms of a typhoid character appeared. External cold applications, leeches to the parts, and the administration of the mass of blue pill, succeeded by saline purges, were the measures we adopted. I am not aware of any distinctive marks between the arterial and the venous inflammation in these obscure cases. 2. Metastasis to some of the great cavities, or organs. Large quantities of purulent matter are sometimes found in fatal cases of amputation, in the thorax, either in the substance of the lungs themselves, or floating loose in the cavity ; or serous effusions, and great congestion of blood in the body of the lungs, with conversion of them into a substance resembling liver, designated by the appropriate appellation of hepatization, by the French surgeons. In the abdomen, abscesses are often discovered, particularly in the liver, and at a very short period from the removal of the limbs. In the adjacent joints also, matter is frequently found. I have met with it in three cases, in the hip-joint, where the operation had been performed in the thigh, and two in the shoulder-joint, where the arm was carried off by cannon shot ; and even in parts still more distant from the original injury, diseased actions, apparently sympathizing with the

state of the stump, have also been discovered. Mr Guthrie has met with the thyroid gland almost totally suppurated. I know of no particular set of symptoms that peculiarly characterize these instances of metastasis. Great irritative fever has been present in some cases; hectic and topical affections of the chest, as dyspnœa, cough, and sense of suffocation, have been found in those where metastasis to the thorax has taken place; and the usual symptoms of deranged biliary functions have appeared before death, where the liver has been its seat. Of the cure of cases of this nature I can say nothing satisfactory.

3. Diseases of the bones, or of the joint close to the amputated part. These admit of the easiest recognition in the living subject, and are various in extent and degree, and when not proceeding to the last stage, or not having superinduced great general debility, may be in some measure alleviated. They are always attended with inflammation, and separation of the periosteum, although in some cases the cicatrix remains sound over the end of the stump; and it is only after a separation of the soft parts, in consequence of an abscess, or ulceration, that the bone is found denuded for various lengths, sometimes close up to a joint, and lying an extraneous body in the centre of the muscular mass, exciting and keeping up a degree of irritative fever, which but too often proves fatal. Nature makes great exertions to remove the diseased bone; and if the constitution is sound, and aided

by gentle means, often succeeds. The absorption is always made in irregular lines, never dividing the bone completely circularly, but giving it the appearance of being splintered ; sometimes this denutilation takes place all round the shaft, at others only partially ; but in all, absorption seems to have been as powerfully exerted within the canal of the bone, as on its external surface, giving both surfaces a worm-eaten or perforated appearance. I have sometimes removed a piece of bone of six or eight inches long thus eroded. The contrast between it and the bone of a sound stump has been curious ; in the latter the bone is plump, exquisitely rounded, and the hole leading to the medullary canal small, and covered with a fine pellicle ; the cancelli beneath entire. In the other, the bone is wasted and discoloured ; the sawed end flat as when the instrument was first applied ; the orifice wide, and without any membranous covering, and the cancelli destroyed. The same contrasted appearances take place where there are two bones in the limb. These in the sound state of the stump are united by callus, and rounded off by the action of the absorbents. In some instances, the original diseased bone is sheathed in a new formed osseous sponge, extending considerably above its end. The luxuriant bony growth is almost peculiar to man ; in the accidental injuries of brutes it is scarcely to be seen ; and it is therefore reasonable to attribute much of its production to bandages and pressure.

On the subject of this class of diseased bones, which is so highly important to the hospital-surgeon, Bonn, "*Thesaurus Ossium Morbosorum*," Amstelodami, 1788, and Weidman, "*De Necrosi Ossium*," Francofurti, 1798, are excellent ; and the Thesis of Macdonald, "*De Necrosi ac Callo*," Edinburgh, 1799, is highly interesting. Louis has given some excellent papers in the 2d and 4th vols. of the *Memoirs of the French Academy on bone projecting after amputation*. Leveillé has published a memoir, "*Sur les Maladies des os apres Amputation*," in the *Mem. de la Soc. d'Emulation*, tom. i. p. 148. A comprehensive inaugural dissertation, with some good plates, was published at Leyden in 1803 by Van Hoorn on the same subject ; and Roux published a prize essay, "*De la Resection d'os Malades*," at Paris in 1812. The "*Mémoires de Physiologie*," published at Paris in 1804, under the joint names of Scarpa and Leveillé, are also well worth consulting.

If the general health is not impaired, and the flesh does not peel off from the bone as if it was boiled, the efforts of nature may be trusted to, aided by proper bandaging, and, in some cases, by the employment of the saw ; but when restless nights, intense pain, flushings, and irregular bowels, with great tumefaction and hardness of the stump take place, indicating approaching hectic, and there is evidence of an irregular action of the parts, osseous matter becoming deposited and

forming a palpable tumour around the stump, our best plan will be to operate again nearer the trunk. In cases of long standing, no partial removal of bone will supersede this necessity, for the soft parts in the vicinity of the bone take on a diseased action, from which they never recover. A generous diet, and removal to a pure air, if possible distant from an hospital, will be indispensable to recovery after operation. I shall conclude this interesting subject by some striking cases, selected from a large number of a similar kind.

#### CASE.

CHATELOT, a French soldier, was admitted into hospital on the 20th April 1815, with an inflamed and gleetng stump below the knee ; the general health was greatly affected. He complained of a short tickling cough, attended with the expectoration of gross matter ; his breathing was hurried ; and, on taking a full inspiration, pain was excited in the breast ; the pulse quick, with increased heat of surface ; the tongue white, but moist ; the appetite good ; the bowels loose. About eight days before his death, the symptoms became much aggravated, particularly the difficulty of breathing and cough, which was hard and distressing ; the pulse was increased in rapidity and hardness, with great heat of surface. To relieve these symptoms, he was bled, and a large blister was applied to his breast ; these, however, procured very



slight if any relief ; he got gradually worse, and he fell a victim on the morning of the 13th September. On opening the cavity of the thorax, a considerable quantity of fetid gas issued from both sacs of the pleura with great force. The lungs were found very much collapsed, and almost floating in serum. In the right cavity the effused fluid amounted to nearly a pint. It was turbid, and there floated on it a great number of yellow flakes, resembling those which are discharged from scrofulous abscesses. There were no preternatural adhesions between the lung on this side and the pleura ; its colour was very dark, and its whole substance was crowded with small tubercles about the size of garden peas. These bodies were of a grey colour and firm consistence, nearly resembling indurated lymphatic glands. The lower part of the left lung, both to the touch and to the eye, appeared quite healthy ; towards its root a number of tubercles were felt, on cutting into which yellow pus was found. Between this lung and the pleura there existed a few slight adhesions. The quantity of fluid in this side of the thorax was about three-fourths of a pint. It was more transparent than that in the other, and no flakes of matter floated in it. Three or four ounces of effused serum were found in the pericardium ; it was quite transparent, and contained a considerable quantity of gelatinous matter, yellowish in colour, transparent, and of the consistence of the coagulum of .

healthy blood. The internal surface of the pericardium was rather more vascular than usual; there existed no preternatural adhesions between it and the heart. The heart itself was natural in size and appearance, excepting that its veins were rather turgid. No other peculiar symptoms were observed.

#### CASE.

CAPTAIN C——, 12th Portuguese infantry, had his left thigh amputated to rescue him from the consequences of hectic fever and profuse suppuration, from a compound fracture of both bones of the leg by gunshot, received at the battle of Toulouse. The hectic was arrested, and every thing went on well for nine days after the operation, when he was seized with violent difficulty of breathing, and frequent irregular attacks of rigor, without being able to refer to any part as the seat of pain. On the 4th day from this attack, he unexpectedly expired. Some illiberal reflections having been thrown out against the operator in this case, I examined the stump minutely after death, and found every thing connected with the operation perfectly right. There was a remarkable fulness observable in the right hypochondrium, which was accounted for on opening the abdomen, by the appearance of an immense abscess occupying all the superior part of the great lobe of the liver, which had discharged a portion of its contained pus

through the diaphragm into the thorax. Captain C—— never complained of pain in this region, and for nine days subsequent to the operation seemed only to labour under rapidly increasing debility. He was a healthy man, and of regularly temperate habits. \*

#### CASE.

MICHAEL M——, 3d regiment of guards, had the right lower extremity amputated below the knee, on the 11th of July 1815, in the Jesuits Hospital, at Brussels. On the 18th, the stump became very painful, and his bowels were costive. On the 27th, inflammatory fever set in, which assumed a remittent form, but by the 29th became continued and much aggravated in violence. Bark, which had previously been employed, was now left off, and the heat of skin being great, he was sponged with vinegar and cold water, which soon lowered its temperature. During these appearances of general disease, the stump assumed an unhealthy appearance; and on one day slight hemorrhage took place—a bed sore also formed on his back. By the 1st of August, the febrile symptoms became very severe. Delirium took place, attended with great prostration of strength, and he died on the 3d. The body was inspected on the afternoon of his death, and the following appearances

\* Communicated by Staff-surgeon Hughes.

were reported to me by Hospital-Assistant Nichol. In the thorax, extensive adhesions were observed between the pleura costalis and pulmonalis. The right lung seemed perfectly sound; but on the posterior part of the left lobe, several tubercles were observable in a state of suppuration, and a greater than usual quantity of fluid was found within the pericardium. The abdominal viscera all appeared sound. On making an incision over the hip-joint of the right side, a considerable collection of matter was discovered around the trochanter major, chiefly external to the capsular ligament. The trochanter at one point was denuded of its periosteum. The synovia of the joint was changed in appearance, having a dark yellowish tinge. These diseased appearances had no communication whatever with the stump.

Nature sometimes effects a cure by the discharge of this matter, collected in or near the joints, but it frequently remains unnoticed until death, although, in some cases, an obscure diffused kind of swelling gives room to suspect its formation, and suggests the propriety of topical blistering and venesection.

The following case, furnished me by Assistant Staff-surgeon Blackadder, is very illustrative of some of the circumstances attending field amputation, and the combination of causes tending to produce the fatal event.

## CASE.

B. J. aged twenty, was wounded on the 18th June 1815, and admitted into the Gens d'armerie hospital on the 30th. A cannon-ball had carried away the left leg, and the stump had been amputated on the field. He stated, that, at the moment of the operation, the French were obliged to retreat, and that the surgeon, on that account, not taking time to secure the blood-vessels by ligatures, merely applied a large cushion of charpie, along with a bandage, and then left him to his fate. He also stated, that for several days he had nothing to eat or drink, and that the stump had not been dressed till ten days after the operation had been performed. When admitted into the hospital, the granulations had a clear but somewhat bleached or boiled appearance. The bone protruded about an inch, and had become black at its extremity, and he complained of increased sensibility and pain in the stump, particularly on moving or touching it in the operation of dressing. His pulse was quick, small, and sharp ; his skin hot and dry ; his appetite bad ; his belly costive ; and his tongue covered with a white mucus, somewhat yellow towards the base.

Laxatives, followed by diaphoretics, were administered, and the latter persevered in for several days without any mitigation of the febrile symp-



toms ; the stump became daily more painful, but without swelling or inflammation ; the granulations retaining their peculiar white glistening and indolent appearance. At length, the skin became moist, and his pulse softer and less frequent, but the irritability of the system was evidently increased, accompanied by a disposition to spasmodic action in the muscles, particularly those of the face. On the 22d July, he became suddenly very uneasy and restless, and died on the morning of the 23d. Upon examination after death, the femoral vein was found ulcerated at its cut extremity ; all the large *veins* of the stump were found to have been inflamed ; they were remarkably vascular, and their coats very much thickened. Unfortunately, from the great pressure of duty, the state of the vena cava was not examined. There could be little doubt, however, that the inflammation had extended to the heart.

There was a small collection of matter on the outer surface of the femur, and also in the substance of the bone near its cut extremity, where there was a considerable deposition of bone in the form of sharp *spiculæ*, pointing toward the trunk of the body, but no marks of commencing separation of the dead from the sound parts.

## INJURIES OF PARTICULAR PARTS.

## WOUNDS OF THE HEAD.

IF the complications in the symptoms of injuries of the head, as they occur in civil life, are of a nature so serious as to have employed the attention and the pens of some of the greatest ornaments of our profession ; it may well be imagined how infinitely aggravated they become, when they happen on the field of battle, when the projectile force of the inflicting body is so vastly greater than on ordinary occasions, and the aid of surgery so much later in its application. Fortunately, however, injuries of this description form by far the smallest number of the cases which a great battle produces. It may be stated generally, that three fourths of the wounds will be of the trunk and extremities, and that one half of the injuries of the head are left dead on the field, or die before assistance can be afforded : but all correct calculations on this subject are totally impossible. In sieges, where the troops are exposed in the trenches to the fire of the enemy, placed several feet above them, the number of wounds of the head will naturally be increased ; and in cavalry attacks, where the weapon hitherto most generally used, the sabre, is so particularly directed against the head, they will also more fre-

quently appear, though certainly under a less aggravated form than in infantry encounters.

The young surgeon, who for the first time witnesses a series of injuries of this description, will at every step have something to unlearn ; he will find symptoms so complicated, contradictory, and insufficient to give any rational clue to their causes ; diagnostics, of the truth of which he had read himself into a conviction, so totally unsupported by the results of practice ; and the sympathies he was led to look for as infallible accompaniments of certain states of disease so often altogether wanting ; that he will probably be inclined to relinquish the hope of ever arriving at a correct theory, or, at least, he will enter the clinical ward with the pride of science considerably subdued. I offer the few following observations, merely as illustrative of some leading points of the general doctrine in a class of injuries, exceeded by none in the extensive range of the profession for interest and importance, and on which volumes might be composed without exhausting the subject, or fully elucidating it. I shall follow the usual division ; of injuries of the containing parts, and of injuries of the organs contained ; but excessive refinements in distinguishing the varieties I conceive to be unnecessary to the practical surgeon ; and if, in the treatment, he makes the prevention or subduing of Inflammation his great end and aim, he does nearly all in the first stages that is within the reach of his art.

To effect this desirable object, nothing should

be omitted in serious injuries of the parts, (and who has not seen apparently the most simple terminate seriously,) to remove every source of irritation. We, now-a-days, it is true, do not cut away the injured scalp, or procure artificial exfoliation of the uncovered bone ; but I certainly think we but too often omit making ourselves perfectly acquainted with their state, by being content with a superficial incision, and a clipping of the hair surrounding an injury, instead of a free opening, and shaving to a sufficient extent, as practised by our forefathers. Independent of the more accurate view we procure by these means, we facilitate the application of leeches, if they may be found necessary, and of a most excellent adjuvant on all occasions, viz. cold applications, which are ever soothing to the patient, and often materially assistant to his recovery. I think also that I have observed a much less frequent use of the very powerful auxiliary of nauseating doses of antimonials than their utility warrants ; and, although I would not go so far as Desault, and other French surgeons, have done in the recommendation of them, I certainly am of opinion, that, in the British military hospitals, they have not generally met the attention they are entitled to. By the employment of those external and internal means ; by the use of mild saline purgatives, preceded by the common blue pill ; by quiet and by abstinence, we will often prevent altogether those troublesome puffy enlargements, and erysipelatous affections of the scalp, which so often suc-

ceed to bruises. And I may here observe, that those extensive and formidable erysipelatous affections, so common formerly, are rare and mild at present in military hospitals, where the evacuant plan is duly observed, and cleanliness and ventilation properly attended to ; while in the civil establishments, the affections of the skin in acute diseases are also most remarkably diminished. \*

In bayonet thrusts, which frequently are very extensive, judicious incisions, so as to leave a free space for the tumefaction that almost always succeeds them, should be employed, along with the means just mentioned. In gunshot wounds not penetrating the cranium, the throwing off of the sloughs is sometimes tedious, and will require an emollient poultice or two instead of the cold applications. Fractures, from gunshot, are almost universally of the compound kind, and are very rarely, indeed, unaccompanied with great depression of the skull. Sabre cuts admit frequently of being at once replaced ; and, in many instances, though very extensive, they adhere without further trouble. In some inflicted by our dragoons in Spain and Belgium, sections of the scalp, bone, and brain, were frequently made, and in many instances successfully replaced.

In all these cases, the general principles of

\* Vide Willan on Cutaneous Diseases, Ord. 3. Genus Purpura, p. 468.



surgery are equally applicable as in the accidents of civil life. The difficulties, however, of elevating or extracting the depressed portions of bone beat in upon the brain by gunshot, or the extraneous matter carried into its substance, are much greater comparatively; the ball, from the projectile force communicated to it, not only fracturing the bone, but hurrying in with it the detached piece or pieces, and jamming them under or amongst the sound parts; frequently, also, it lodges among the fractured portions; frequently it imbeds itself between the more solid osseous plates, and forms a kind of nidus in the diplœe; and sometimes it drives forward into the brain itself, eluding the search of the surgeon, and subverting the theories of the physiologist. In the majority of cases, a leaden ball is either flattened against the bone, or, if it has struck obliquely, it is cut against the unshattered edge of the cranium; and is either simply jagged, or is divided into two or more distinct parts, forming with each other various angles, influenced in their acuteness by the projectile force, the distance, obliquity, &c. &c.

It not unfrequently happens, that a perfect division of the ball takes place; and the two distinct masses lodge, or one lodges and the other flies off totally; or else it takes its course through a different set of parts, or imbeds itself in a different spot from that where it originally struck. In all those cases, the removal of extraneous matters, the extraction

of the fractured portions, if they lie loose, and the elevation of the depressions, where it can be done without the infliction of additional violence, are, of course, the first steps to be taken; but instances (particularly on the field) will occur, where this cannot be done. The grand and leading point to be kept in view in those cases, is the great tendency to inflammation of the brain and its membranes, the uncertain period at which it may occur, and the very doubtful consequences which may succeed its occurrence. So irregular, however, and as it were so capricious is nature, that, while the slightest causes produce inflammation in its most violent and aggravated forms, extensive injuries, fracture, depression, and even permanent compression from lodgment of balls, have been followed by no such consequences. In the following case, the injury to the brain, and the extinction of existence, were contemporaneous.

#### CASE.

IN May 1804, in a squabble between two soldiers, one of them, who was sitting on the side of his bed cleaning the barrel of his musket with his ramrod, was struck at by the other. He raised the ramrod to deter the man from prosecuting his blow. The unfortunate fellow, however, slipt in the act of striking, and received the point of the ramrod just above the root of the nasal process of the frontal bone, and instantly dropped dead. Staff-

Surgeon Hughes, who examined the head in the presence of a coroner's inquest, found, that the iron had entered obliquely, running a little towards the left side, slanting upwards, and penetrating the anterior lobe of the left hemisphere of the cerebrum to the depth of an inch. There was no effusion of any kind, or any unnatural appearance, except the hole made by the weapon. With this case, it may be well to compare that very remarkable one mentioned by Mr Larrey,\* in which the patient survived to the second day, where a ramrod had actually passed through the os frontis; between the hemispheres of the cerebrum; through the thick part of the sphenoidal bone; and through the condyloid foramen of the occipital bone, without injuring any important organ. The preservation of this skull in the collection of the Faculty of Paris, places the fact beyond question.

The instances of death, after the setting in of inflammation from very trifling causes, are of almost daily occurrence, and would induce us to anticipate its certainty after all violent injuries; but it is a great mistake, now acknowledged by the best surgeons, to suppose that every depression requires an elevator, and every fracture the interference of art; although it is a common one, fallen into by

\* Vide Memoires, Vol. III. with a Plate. Compare also a case by Curtis, on the Diseases of India, p. 254, where a boy ran on an iron spike, and lived for twenty-six days without much apparent injury.

the juniors ; and even among the older class I have seen the instrument case unlocked, and the scalpel unsheathed on very unnecessary occasions. The following case illustrates this point.

#### CASE.

CORPORAL J. COCKEYNE, 33d regiment, received a wound from a musket ball at Waterloo, which struck the right parietal bone at its junction with the occipital, close upon the union of the lambdoidal and sagittal sutures, and fractured the bone to an extent exactly corresponding with its own size. The ball was split into two portions, forming nearly right angles. It was easily removed, but from the narrowness of the passage, and from the depth to which the fractured portion of bone had been driven into the brain, (being exactly an inch and one-fourth from the surface of the scalp,) no operation was performed on the field ; and as no one bad symptom occurred in the hospital, I did not allow the wound to be meddled with there, although much and frequently solicited by some of my medical friends. I trusted to venesection, a most rigid abstinence, open bowels, and mild easy dressings. On the 14th July, or 26th day, the wound was nearly closed, without any one untoward symptom, and the functions were in every respect natural. In a few weeks after the man was discharged cured. In a similar case, where the man survived thirteen years, with no other inconvenience than occasional



determination to the head on hard drinking, a funnel-like depression, to the depth of an inch and half, was formed in the vertex. I am in possession of several other instances of a similar kind.

We have here sufficient proof that there is no absolute necessity for trepanning merely for depressed bones from gunshot, although few would be so hardy as not to remove all fragments that came easily and readily away. We would also naturally remove all extraneous bodies within view or reach ; but before we commence any unguided search after them, we ought seriously to balance the injury that we may inflict. I by no means wish to be understood to say, that we ought not to endeavour cautiously to follow the course of a ball, when unfortunately it has got within the cavity of the cranium. M. Larrey asserts that it can be done with safety and with effect. He informs us, that he traced a ball which entered the frontal sinus of a soldier during the insurrection at Cairo, by means of an elastic bougie, from the orifice to the occipital suture, in the direct course of the longitudinal sinus, and by a corresponding measurement externally he was enabled successfully to apply a trepan over it and extract it. The patient recovered. M. Percy, on the other hand, gives us a fatal instance, where a ball was absolutely within reach of the forceps, and yet for want of a sufficient opening and manual dexterity in the operator, it slipped into the brain ; and although the opening was enlarged



by the trepan, it could not be recovered. In the works of some of the older authors, we meet with cases where epilepsy and various other bad symptoms have followed the attempts at extracting arrows and other missiles sticking in the brain. A modern surgeon would be severely and justly censured for not at least making a trial ; but we are encouraged to look for the eventual safety of our patients, when the course or actual site of the ball or other body is unknown, by recorded and well-authenticated instances of life being preserved, when they either have not been looked after, or their existence has not been suspected.

The records of surgery furnish us with many proofs of metallic and other bodies lying for long periods between the cranium and dura mater ; but experience shows, that the extraneous bodies may lie even in the brain itself without producing death.\* I have seen no less than five cases where a ball has lodged in the substance of the cerebrum, without immediately producing a fatal event. The

\* In the "Mémoires de l'Académie Royale de Chirurgie," Tom. I. p. 310, folio edition, is a most interesting paper by M. Quesnay on wounds of the brain, extremely well worth consulting, in which he has amassed a number of cases of this description. The catalogue might be very easily enlarged, and may be seen at great length in the references of Ploucquet, in his learned and laborious "Literatura Medica Digesta," &c, Tubingen, 1809.

following curious and instructive case was furnished me by Assistant Staff-surgeon Blackadder :

#### CASE.

D. M. aged 27, a soldier in the service of Buonaparte, was wounded on the 18th June 1815. After lying three days on the field without tasting food of any description, he was taken to a village, and afterwards to one of the churches of Brussels, without any thing having been done for his wound. On the 30th I sent him, with many others, to the Gens d'armes Hospital, and on the 4th July he was placed under my immediate care.

A musket ball had entered at the anterior portion of the squamous suture of the right temporal bone, and, passing backwards and downwards, fractured in its course the parietal bone, and lodged itself in the substance of the brain. There was a considerable degree of tumefaction of the soft parts surrounding the wound, but, with the exception of a slight headach, and partial deafness of the right ear, he seemed to enjoy perfect health. He slept well—his appetite was good—his belly open—his tongue clean—his skin cool—and his pulse 72, of natural strength.

On the morning of the 5th the wound was laid freely open, when three large and several small pieces of bone were removed ; and the ball, which was found lodged in the posterior lobe of the right hemisphere of the brain, where it rests on the

tentorium, was extracted without difficulty, and with small portions of the substance of the brain adhering to it.

After the wound had been carefully cleared of blood and small pieces of the brain, its lips were brought together and retained by two ligatures, along with adhesive straps, compress, and bandage. His whole head was kept constantly wet with cold water ; a brisk purgative was administered, and he was placed on a very spare diet, with a small allowance of ripe fruit.

Under this management (a laxative being daily administered) he continued free from pain, or any derangement of the system, until the 16th, when he complained of lancinating pains through the back part of his head, of uneasiness from the light of a candle, and from noise. The wound looked remarkably healthy, with only a small discharge of healthy pus, and all that part which had been laid open by the knife was united. The pulsation of the brain could be readily discovered at two different points, where the large pieces of bone had been extracted. A brisk cathartic speedily removed these untoward symptoms, which, there was reason to believe, had been produced by some of his fellow patients having indulged him with part of their allowance of food, the impropriety of which was distinctly explained, and means used to prevent the repetition of a similar irregularity. This, however, was no easy matter, as his appetite

was keen, and he was confined to a very spare diet, viz. a small allowance of bread, with water whitened with milk, and sweetened with sugar.

He now continued to enjoy his former good health, and nothing particular occurred till the 24th, when, on going my usual rounds, betwixt 10 and 12 o'clock P. M. he called me, and said he was not well; the expression of his eyes was new and peculiar; and, along with the fulness of his countenance, evidently indicated a great and general irritation of the system. His pulse was, for the first time, 96, and hard; his skin hot and dry; along with a degree of stupor, and disposition to sleep. Upon making inquiry, I found that the medical officer (a young gentleman who had recently entered the service) under whose care he had been placed for the last four days, had omitted to give him his usual laxative, and instead thereof, had that day allowed him *wine*, an *egg*, and other *extra articles*.

A brisk cathartic was again immediately had recourse to, and after its operation a diaphoretic mixture, which, with a rigid adherence to his former mode of treatment, soon restored him to his previous state of convalescence.

On the 5th of August, when I saw him for the last time, his wound was cicatrized. The pulsation of the brain was still visible, but, with the exception of a slight degree of giddiness on stooping, he enjoyed perfect health. This he expressed, by



saying, that from his sensations he could not know that he had ever been wounded. It is proper to add, that, during the time of the above cure, he was allowed to smoke tobacco whenever he felt inclined, and which was almost constantly. It was never observed to produce any bad effect, and he argued the necessity of using it, by saying, that it mitigated the otherwise almost irresistible urgency of his appetite, and thereby enabled him the more easily to comply with the very restricted regimen that was enjoined him, and which, as he was at length convinced, was essential to his recovery.

In the following case, the heads of which I received from Staff-surgeon Halkett, it is difficult to say to what period life might have been protracted.

#### CASE.

A SOLDIER of the 8th regiment of infantry was shot in the head during the late Canadian campaign. A fracture was the consequence, with a depression of not less than an inch and half, but, as no untoward symptom occurred, no operation was had recourse to. This man recovered, and went to the rear, where, at a distance of several weeks afterwards, he got an attack of phrenitis from excessive drinking, and died. As the existence of the ball in the brain was strongly suspected, an inquiry was made after death, and, on dissection, it was found lodged in the corpus callosum.



A very curious and interesting observation of this kind is given us by Quesnay, which is very much in point :—A Brigadier in the service of the French King, received a musket-shot above the eye-brow ; he was sufficiently recovered to return to his duty in the field the ensuing year, where he died, as it was supposed, of a coup de soleil. On opening his head, however, the ball was found to have penetrated two fingers' breadth into the brain, where it lodged without giving rise to any morbid symptoms. M. Anel gives another case, quoted by M. Quesnay, in which a ball had fractured the frontal bone, and lodged in the brain. The wounded man was cured, and the ball remained for many years in his head, without giving him any inconvenience. At last he died suddenly, while playing a game of cards. The surgeons who had attended him opened his head, and found the ball lying upon the pineal gland, along with some recently effused coagulated blood.

M. Martiniere presented to the French Academy of Surgery, an Invalid in whom a small fistulous sinus existed in the lower part of the frontal bone, occasioned by a wound from a musket-ball which had not been extracted. During the cure of this wound, many exfoliations were detached from the internal table of the bone ; the route of the ball could be easily traced with the probe along the sinus, but its exact site could not be discovered ; and at length, after a variety of accidents, as

fever, stupor, delirium, &c. on the 27th day, the patient appearing out of danger, the wound was allowed to heal, the ball still remaining within, and a small sinus alone marking the seat of the injury.

The following case is one of more recent occurrence, and the individual may probably be alive at this moment.

#### CASE.

FAVRE, a Chasseur of the Imperial guard of Napoleon, who had fought at Borodina, distinguished himself most gallantly on the field of Waterloo. No mounted British soldier was enabled to unhorse him on that day; but he at length fell, amid a shower of musket-balls, one of which penetrated his left temple, at the junction of the three sutures. With the symptoms which immediately followed I am not acquainted, but, from the history given by Favre himself to the medical officers in attendance, Staff-surgeon Laisne, and my friend Dr Knox, who favoured me with the heads of the case, it was obvious that he had lain insensible for three days and nights, and that violent inflammation had taken place before he was brought into the British hospital.\* The entrance of the ball, and its course within the brain were very evident to the eye and probe. In October,

\* The Gens d'armes at Brussels, Division 1.

four months after the battle, this man was alive, and, without any constitutional injury, or disturbance of any one function, was performing the part of an assistant and orderly to his less fortunate comrades. A small suppurating sore, but discharging moderately, then remained in the site of the wound, and he felt occasionally some giddiness and headach. Favre, like many other people, was not content with his good fortune, but wished *something to be done for him*, and prevailed upon a young man to apply a bit of caustic to his wound, to remove a small papilla of fungous flesh, and dry up the discharge. Severe pain and corded feeling of the head, with hot and dry skin, bounding pulse, suppression of discharge from the wound, and, in short, every symptom of alarming fever, soon made their appearance, and this at a period when low fever and erysipelatous inflammation spread over every wound in the hospital, and rendered the use of the lancet questionable, if not hopeless. However, by means of steady purging, and other active measures, he recovered in four days, leaving an impressive example of the danger of ignorant interference. He returned to France with his recovered comrades shortly afterwards. Before he left the hospital, the vision of the eye on the wounded side began to fail, and, to an accurate observer, the power of the muscles of the eye and of its lid, particularly the levator, appeared to be impaired. In expressing his gratitude to his attendants for

their humanity, and for the perfect cure he owed to their attention, he observed, "that so little inconvenience did he feel, that, could it benefit the Emperor, he would willingly receive a ball in the other side!!"

This lodgment of balls does not destroy the restorative powers of nature, as the fractured and separated pieces of bone often make a considerable progress towards perfect reunion. Mr Hammick, surgeon of Plymouth Royal Naval Hospital, has a very remarkable preparation illustrative of this fact. A large part of the frontal bone, nearly four inches in circumference, including the superciliary ridge and subjacent frontal sinus, is carried outward and overlaps the temporal fossa; the bony union is nearly complete; while a musket ball is lodged deep in the anterior lobe of the brain. The man from whom the preparation was taken was wounded in Spain, and died at the distance of two months after in Plymouth.\*

Lodgment of balls, and great depression of the bones, will often exist unsuspected and unnoticed for days, until an inflammatory disposition is excited by some errors of diet, or other accidental occurrence, when all the symptoms burst forth at once. The following case strongly illustrates this.

\* Mr Gooch gives an instance of a musket-ball in the brain, the patient recovering, and Ramdhor another in the "*Ver-mischte Chirurgische Schriften*" of Schmucker, in which the patient survived four weeks.



## CASE.

A SOLDIER of the light company of the 79th regiment was wounded at the battle of Quatre Bras, on the 16th June 1815, on the posterior part of the occipital bone, inclining towards the right side. He could not tell by what weapon, nor did he immediately perceive the accident ; it was only after retiring about an hundred paces, that, on the information of his comrade, he discovered he was at all injured ; and presently after he got faint from the loss of blood, and experienced great sickness of stomach. He lay on the field that night, vomiting occasionally, but without being able to sleep. He was removed by the peasants next morning to an adjoining barn, but neither bled nor purged ; a dressing being simply applied to the part. The succeeding day he was removed six miles on the road to Brussels, and placed in a barn with other wounded, where he was attended by a Prussian surgeon, who did no more than apply some lint and a roller. Here he remained for nine days, till he was removed to Brussels, during which period he felt excessive pain in his head, with great dimness of sight and loss of memory. The vomiting, however, had ceased, but he had had no stool for twelve days. He went to his old billet, and was for five days attended regularly there by two civil practitioners, who dressed the wound, and administered occasional purgatives. He im-



proved in strength, but still complained of vertigo and giddiness; his appetite declined, (notwithstanding that his kind hosts gave him what he called *strengthening* articles of diet;) his thirst was urgent, but he drank no wine from the evening of his wound, except about a pint given him in the barn by the country people. On the 7th of July, or the nineteenth day, he was received into hospital at Brussels, and placed under the care of Staff-Surgeon Hill, with whom I had frequent opportunities of witnessing the progress of the case. The injury in the scalp was almost perfectly healed, and looked more like a bayonet thrust than a gunshot wound. He walked about the ward apparently in good health, and only complained of slight headach. Two or three days after his admission, a very copious purulent discharge took place, together with an occurrence not unfrequent in injuries of the head, viz. a sympathetic swelling of the parotid gland of the right side, which seemed to be connected with the wound by a narrow fistulous opening. A probe entered without the smallest resistance, and to such an extent as to render it improper to push it further; but suspicion was excited in the mind of the dresser, who, on examination, detected a fracture with depression of that part of the occiput opposite the internal transverse ridge on the right side. The man's countenance had become flushed, the thirst was urgent, and languor excessive; there was no shi-

vering, however, nor was there any puffy tumour or surrounding inflammation. On the 15th July, a free dilatation of the part was made, and the surface of a ball was discovered firmly impacted into the bone ; when extracted, it presented a very ragged appearance, having been cut against the sound part of the bone, and one portion of it was very much elongated. The trephine was now applied by Staff-surgeon Hill, and two large pieces of bone were extracted, together with five lesser fragments, from an inch to the fourth of an inch in size. The largest portion was completely beat into the brain, the lesser was forcibly depressed on it. The patient sat upon his bedside during the operation, his head supported on the breast of an assistant. A small quantity of blood, which seemed to spring from the basis of the skull, followed the extraction ; and his pulse, which had previously been scarcely perceptible, immediately rose and felt soft, while a pain, of which he complained in the anterior part of the head, disappeared. He evinced no loss of muscular power, or paralysis, on the visit at seven o'clock in the evening. Next morning his skin was cool, his pulse 90 and soft, his thirst diminished, but he had not slept. During the day he had some slight nausea, which was relieved by lemonade. His bowels not being free, he had a solution of Epsom salts, and an allowance of some ripe fruit with his spoon diet. He slept two hours during the next night, and had some

free evacuations of the bowels, with a slight degree of epistaxis. On dressing the sore, a small discharge of reddish grey serum took place, and his pulse was harder and more frequent than before. Eighteen ounces of blood were abstracted from the arm; and as the pulse, which after the bleeding had sunk, rose again about three o'clock on that day, (the third from the operation, and thirty-first from the infliction of the wound,) venesection was repeated to the same extent. On tying up the arm he had a slight rigor, and at ten at night he had another more considerable, which pained his head severely. On the succeeding day it was found that he had had another rigor in the night, with severe pain of the head, a quick but soft pulse, but no derangement of the stomach; belly costive. From this period, up to the 28th of July, he improved perceptibly. He had some occasional irregular rigors, succeeded by profuse sweats, now and then costiveness, and sometimes severe pain in the head, all which were relieved by purgatives; but the wound went on gradually towards a cure, and only on one day did a dilatation of the pupil give any indication of the injury of the head which afterwards appeared. On the 29th day of July, or forty-third day from the injury, a regular intermittent fever attacked him, which was treated in the usual manner. This lasted for five days, when it degenerated into a remittent form, then prevalent in the city, which

also yielded to the remedies employed, and he proceeded rapidly towards convalescence, his appetite being particularly craving, until, on the sixty-third day from the wound, and forty-fourth from the operation, a fungus of the cerebrum was observed divided into two parts by a deep fissure, so as to resemble the nates; and at the same time a large tumour appeared, extending from the axilla across the inferior angle of the scapula, filled with a quantity of extremely fetid matter. No relief followed the evacuation of this; and the tumour of the brain went on increasing in size, and with strong pulsation on the surface, but with great depression, fluttering, and intermission in the pulse at the wrist, till it burst on the third day after its discovery, discharging a quantity of fluid during the night. The succeeding day he was attacked with tenesmus and occasional vomiting, and some of the cerebral substance was discharged by the wound. The day following the senses were much impaired, and he became delirious. The stools were now involuntary, and the brain continued to be discharged at the wound. He got progressively worse; his mouth became distorted towards the right, (on which side he was wounded;) his countenance was expressive of deep anguish; the discharge of the brain increased; and he expired in strong convulsions on the morning of the 23d August, the ninety-eighth day from the injury.



The dissection showed much thickening and inflammation of the dura mater ; and an extensive attachment had taken place between that membrane and the cerebellum. The dura mater, all round the neighbourhood of the injury, was covered with a yellowish brown coagulable lymph, and much thickened ; the pia mater did not partake much of the inflammation. About two ounces of water flowed from between the pia and dura mater, and, on cutting into the ventricle, the plexus choroides appeared much diminished in size. The fungus was formed of the inferior and back part of the cerebrum. Two large fissures extended to the foramen magnum. In the thorax, a large collection of matter was found in the sac of the pleura, and a large abscess in the upper part of the lung of the right side. Both the lungs adhered extensively to the pleura costalis ; but the external abscess in the axilla had no connection with the purulent formation in them : it contained much fetid matter, but had no regular cyst. The heart was sound ; so were the abdominal contents, except the liver, whose lower surface presented a blackish marbled appearance.

Vast quantities of the bone, and of the brain itself, are often destroyed without immediate, or even eventual, death. I have met with some cases where the upper and lateral parts of the cranium, embracing nearly the whole of the parietal bone of one side, and part of its fellow, with a portion of

the frontal bone, have been fractured, and afterwards picked away, so as to expose a large share of one of the hemispheres. A soldier of the corps of Brunswick Oels met with an accident of this kind, in which nearly half the roof of the skull was blown off from the bursting of a shell, and had no untoward symptom until the 10th day, when the brain became in a fungous state, and protruded to a great extent. *He died comatose, with all the symptoms of compression.* In an officer of the ——— regiment, wounded in the same action, the frontal bone was fractured by a shell, and nearly one-third of it was removed, laying bare both frontal sinuses. By the judicious treatment of Staff-surgeon Hill, although the inflammatory symptoms ran high, and temporary insanity took place, this gentleman's life was preserved. It is wonderful what efforts nature will make to cover the exposed brain or its dura mater, if not prevented by preposterous dressings. Now-a-days the scalp is never removed, but I am sure it is not always brought so far over the deficiencies in the bones of the cranium, caused by operations, or otherwise, as it ought to be.

On some occasions the functions are primarily, in others only secondarily, affected. The removal of the depressed portion of bone, or of extraneous matter, is sometimes almost immediately succeeded by a relief of all the symptoms, and restoration of all the functions ; in others, the restoration is more gradual, but not less effectual and perma-

ment ; while in some, perfect relief never takes place. I have met with various instances, in which the sudden restoration has soon been succeeded by a relapse and death, while the more slow, in which no such event had been contemplated, terminated in perfect recovery. During the progress of these and various other symptoms consequent to wounds and injuries of the head, the skin, the tongue, the ear, the eye, the motions and sensations of the limbs, and the actions of the heart itself, are variously and oppositely affected. In the eye, particularly, I have remarked the pupils contracted in some instances, and in others dilated, where the injury seemed to be nearly of a similar nature and degree ; and I have seen one pupil dilated, and the other much contracted, in the same person.

Although we can with much probability say that paralysis or convulsion will take place on the side of the body opposite to the wound, \* yet that

\* *Vide* an admirable paper on this subject in the Medico-Chirurgical Transactions, by Dr Yelloly, Vol. I. p. 183 ; and some valuable cases by Mr Anderson, in the Transactions of the Royal Society of Edinburgh, Vol. II. p. 17. These cases are referred to by Dr Bateman in the Edin. Med. Journal for April 1805. The conclusions drawn from them are,—1. One hemisphere of the brain being affected, morbid symptoms generally appear on the other side of the body : 2. When both are affected, the whole body suffers : 3. If only one is *violently* affected, the whole body suffers : 4. Though the cerebrum alone is hurt, it produces morbid symptoms in all the muscles of voluntary motion, from whatever point their nerves may arise :

occurrence (which is uncertain in its period of attack) will frequently take place either in the upper or the lower extremity, or in the entire of the opposite side, and be either partial or general, from causes which are altogether beyond our research. The opinion, that paralysis took place on one side, (that corresponding to the injury,) and convulsion on the opposite, I have never seen verified by experience. I have seen some cases of general nervous affection of both sides after violent injury, where one has been more affected than the other; and in those general affections, I have observed that convulsions have been a more frequent occurrence than paralysis, when the fore and side parts of the head have been wounded. Paralysis has occurred proportionally oftener in my practice, where the wound or injury approached nearer to the cerebellum. I have, however, seen paralysis of one side and convulsion of another, take place when the blow has been upon the forehead, and the same when it has been on the occiput. Before entirely dismissing this subject, I would offer one caution to the junior surgeons, suggested not by what *may* happen, but by what I have known *actually* to occur, viz. not to forget the effects of a blow on the head, and attribute the inability of motion in the limbs to other causes. I shall give the heads of an instruc-

5. In cases of external accident, the prognosis is most favourable where one side only is affected.



tive case, which will be sufficient to illustrate this point. A stout young fellow had the right parietal bone fractured by a fragment of shell, and the fractured part was much depressed. On recovery from the first stunning of the blow, he found he had lost to a certain degree the power of the opposite side ; and the arm, particularly, was almost useless. By removing the depressed portion of bone, the paralytic affection was totally relieved in the other parts, and partially in the arm. This man passed through several hospitals, and was treated by different surgeons. He ultimately recovered the use of the arm also, but not without various, and, as it may well be supposed, ineffectual attempts at reducing a supposed dislocation of that limb.

Loss of the generative faculty and atrophy of the organs connected with it, have been attributed to blows on the back of the head. The fact is certain ; but whether the antiprodisiac effects proceed from injury to the organs of sexual love, or to a general loss of power, is a subject for future inquiry. M. Larrey gives a case, in which the blow of a sabre had cut off the external protuberances of the occipital bone, and divided the extensor muscles down to the sixth cervical vertebra, whose spinous process was also cut off. This patient, after his cure, in answer to an inquiry on the subject, acknowledged that he had ever since been deprived of the generative faculty. He also gives another, where the testes wasted, and the “ *membre viril*”

became shrunk and inert. In the following case, the confession was not elicited by inquiry, but was the subject of spontaneous complaint to Staff-surgeon Hughes, in whose words I give it.

#### CASE.

GAETANO, a soldier of the 9th Portuguese cazadores, was struck by a piece of shell at Salamanca, in June 1813. It shattered the superior part of the occipital bone from within half an inch of the great knob on the left side, to the lambdoid suture. An irregular angular portion of the left parietal bone, nearly an inch in length and about an inch in breadth, was also fractured and beaten inwards. He laboured under most alarming symptoms, total insensibility, involuntary discharge of feces, laborious breathing, inirritability of pupil, and weak low pulse, with occasional convulsive twitchings. The removal of the depressed portions of bone, and about an ounce of coagulum from the surface of the dura mater, on the second day after the wound, was attended with a diminution of most of the symptoms; and, with two copious bleedings, (which were employed to arrest approaching inflammation,) his recovery was perfected by the November following; except that even then the catheter was occasionally necessary to draw off his urine, the bladder not having recovered from a paralysis, which, for the first three weeks, was so complete as to prevent any evacuation without the

use of an instrument. Of this, however, he ultimately recovered. This man was subsequently attached to the mule with my medical stores, and repeatedly consulted me on the means of recovering his virility, which, he said, the shell had *completely carried away with it*.

It becomes an object of inquiry, on which Mr Hughes could not satisfy me, Did Gaetano lose any other function, the organ of which was injured? The organ of parental affection, according to the position assigned it by Gall and Spurzheim, must have been implicated. Was he as good a father as ever, or did he cease to love children when he lost the power of begetting them?

Some of the functions, particularly of the mind, are often severely and permanently affected, while others are not proportionally impaired, and the loss is of but temporary duration. The powers of speech are often lost while those of memory remain, and the sight is impaired while the hearing is perfect, and *vice versa*. I have met numerous instances of this, and have had patients who told me that they could hear distinctly what I said, and distinguish my voice from that of others,—and have repeated my words as a proof both of this fact and of their retention of memory, while they could not distinguish my person or give utterance to their thoughts. The following case, in which I was deeply interested, illustrates this point.

## CASE.

CAPTAIN B——, a particular friend of mine, was wounded by a musket ball in the head at Waterloo, on the 18th June. On the 19th he was brought into the city of Brussels in charge of a medical officer, who gave me a most melancholy account of his case. On approaching the waggon in which he was conveyed, I was insensibly attracted to that part of it where he was stretched, by a low protracted moan, as of a person in extreme pain, but very weak. On calling him by name, he sat up, caught me by the hand, which he kissed most fervently, pointed to his head, and then to the site of a former wound which he had received at the storming of Badajoz, from the effects of which I had had the good fortune to relieve him. He then burst into tears, but without having the power of uttering a distinct word. His countenance was pale and ghastly, and his mouth somewhat distorted; his eye languid and suffused with blood; his skin dry, but cool; his pulse about 90, soft and compressible. As I found that he had been bled on the field, I contented myself with providing him a billet, and giving him in charge of his medical attendant, with directions to examine the wound most particularly; to enlarge it if fracture to any extent appeared; to administer a brisk purge, and to watch most carefully the approach of inflammation. The wounded being now pouring in by hun-



dreds, I was unable to see him before the 21st; his case, however, was reported to me daily. Much coagulated blood, and some particles of sand on which he had fallen, together with a thin scale of lead, obviously a bit of a split musket ball, had been removed. His pulse had risen on the night of his arrival to about 100, hard and bounding, and he had been copiously bled in consequence. A cruciform enlargement of the wound had been made, which bled copiously, and gave a view of an extensive fracture of the left parietal bone. On my visit I found him nearly as follows: Countenance pale, expressive of great pain, referable more to mental than corporeal suffering; mouth still distorted; eye sunk, but its pupil dilatable; the power of articulating any distinct sound lost, but the desire obviously strong; pulse 80, soft; tongue clean; bowels open, (by saline purgatives;) urine copious, and with a rose-coloured sediment; skin moderately warm, and at the region of the liver bathed in sweat; the liver itself obviously projecting, and giving a painful sensation when pressed upon, evinced by his wincing from the touch. On examining the wound of the head, I found an extensive radiated fracture, occupying almost the whole of the left parietal bone; at the centre there was a piece of bone, apparently the size of a musket ball, beat in through the membranes of the brain, and bedded in its substance, but considerably more toward the frontal region than the occipital.

This unequal pressure I found to proceed from a musket ball which was wedged in between the displaced pieces of bone and the part, which, though cracked, preserved its situation. The separated piece was obviously much more extensive on its internal face than externally, and could not possibly be extracted without the operation of trephining, to which I proceeded. The leaden wedge and several loose splinters which jammed it in were easily removed ; and on making one perforation with a large-sized trephine, I removed the depressed portion of bone, which was forced into the brain nearly an inch and a half from the surface of the scalp. It was of an irregularly oval shape, about one inch long by half an inch broad, and fractured in such a manner, that the internal table formed a much larger part of its circumference than the external. No relief followed the operation ; he passed an extremely restless night, and the pulse rose so rapidly and so high, that the abstraction of 16 ounces of blood became necessary. His breathing during this momentous night became, for the first time, permanently stertorous ; and, when I saw him in the morning, his whole appearance indicated the most extreme danger. He lay *coiled up* in the bottom of his bed ; the right arm stretched out, and occasionally convulsed ; no exertion could get a sight of his eyes, or his tongue ; the mouth was more distorted than usual ; the skin was nearly as on the day of the operation, except that the partial sweating

over the hepatic region was increased in profuseness, and he seemed to wince more on pressure at that part ; indeed, all the sympathies seemed to be entirely merged in those connecting the brain and liver. The stomach participated remarkably little, for he had scarcely any vomiting. His pulse alone gave me some hopes ; it was nearly natural. On addressing him, he made an effort to rouse himself, but almost immediately relapsed into his former state. I directed a strict watch to be kept over him ; and as my duties called me again to that part of the city where he was lodged, I visited him about midnight, and found that a spontaneous bilious diarrhœa had come on, and that he was much more sensible. He made an attempt to articulate, and pronounced audibly the letter T once or twice. The next morning, being the 5th from the receipt of his wound, his general appearance was amazingly altered for the better ; the diarrhœa still remained, and his efforts to speak were continual. On the sixth day he grasped my hand with great fervour, looked piteously in my face, and, to my inquiries as to his feelings, he uttered audibly, though with much labour, the monosyllable “THER,” to which in the course of the day he added “O ;” and for the three next days, whenever addressed, he slowly, distinctly, and in a most pathetic tone, repeated the words “O ; THER : O ; THER :” as if to prove his powers of pronunciation. His general appearance, during all this time,

amended considerably, and my hopes now began to revive. I therefore resolved to write to his family, and, before doing so, I printed in large characters on a sheet of paper the following words, "SHALL I WRITE TO YOUR MOTHER?" that being the wish which it appeared to me he so long and ardently had laboured to utter. It is impossible to describe the illumination of his countenance on reading these talismanic words; he grasped and pressed my hand with warmth, burst into tears, and gave every demonstration of having obtained the boon which he had endeavoured to solicit. From this period his mental faculties gradually developed themselves; he regained a consciousness of the circumstances immediately preceding his wound, and, in succession, of those of a more remote period. The power of speech was the last which he perfectly regained, and for which he usually substituted the communication of his thoughts and wishes in writing. Throughout the whole of his convalescent state, melancholy ideas constantly predominated, although, previous to the accident, he had been remarkable for his flow of spirits. He returned to England nearly recovered on the 29th September, or 103d day from the wound.

I have omitted the minor details of surgical treatment after the operation, as they are not essentially connected with the point I wish to illustrate by the case; and, indeed, I have it not in my power to give them day by day, as, after he had



made some progress towards recovery, I gave him over to another surgeon. I was assisted in the operation by Mr Jeyes of the 15th Hussars; my friend, Mr Lindsay, surgeon to the forces, was very constant in his assistance and advice; Professor Thomson often visited Captain B.; and Staff-surgeon Dakers was indefatigable in his after treatment.

This case may be advantageously compared with one given by Mr Larrey; \* in which a soldier, wounded in the head, formed a new language for himself. He expressed affirmation, not by "Oui," but by the word "Baba." Negatives he gave by "Lala;" and his wants he made known by the terms "Dada," and "Tata." These sounds bore no analogy to the words properly expressive of his ideas. Captain B., on the contrary, strenuously laboured to combine all the simple sounds which composed the words that he wished to express.

In the foregoing case, the sympathy between the brain and liver was strongly marked, and took place at a very early period; but it is, by no means, such an universal occurrence as some practitioners imagine; nor does the affection of the liver, I suspect, so *very* often depend upon the direct injury of the head, as upon certain circumstances connected with it. A class of men more peculiarly

\* Mémoires, Vol. III. p. 322.

liable to hepatic affections than others, are the most frequent subjects of fractured skulls. I mean quarrelsome and habitual drunkards, particularly those who indulge in ardent spirits; and we often find that the liver has been diseased long before the infliction of the injury of the head. It is scarcely necessary to say, that it will very often occur in men of the most temperate habits, and totally unconnected with the affections of the organ from habitual drinking, as was the case with Captain B——. I have known it take place within thirty-six hours from an accident, in a temperate female. It often happens, however, that neither the liver nor any other organ seems to sympathize with the injuries of the head, while, in other cases, almost every viscus will appear to suffer more or less. These sympathetic affections vary in the organs which they attack, and in the degree of violence. In the thorax they appear from simple increased secretion from the lungs, to tubercles and extensive purulent formation in their substance. \* Serum is also often found in the cavity, and very frequently in the pericardium; and even in the heart itself abscesses have been discovered. In the liver, morbid appearances are found throughout every shade of affection of its membranes or its secre-

\* Vide Morgagni, Epistle 51, Articles 17, 18, 19, 20, from Valsalva. And Article 21, from Nicolaus Massa, and Marchetti, a case with abscess in the heart, and water in the pericardium.

tion : either pain and tumefaction, with bilious diarrhœa, or the same with a perfect torpor of its functions, and inflammatory affections, from simply increased vascularity, up to the formation of extensive collections of matter. In the spleen, pain, tumefaction, hardness, and abscess are observed occasionally. The stomach suffers more frequently than any other organ ; but it appears to be more from general nervous sympathy than from any organic affection, which is seldom discoverable on dissection. Bertrandi, who, in the Mémoires of the French Academy, (Vol. III. p. 484 of the 4to edition,) has given a memoir upon the Abscesses of the Liver, which form after wounds of the head, asserts that they are most frequent when the patient vomits a green bile shortly after the receipt of the injury ; when delirium and convulsions supervene ; when blood flows from the mouth, nose, and ears ; when the face tumefies, the vessels of the throat palpitate, and the hypochondria heave convulsively. And, as he says himself, “ *pour ne pas paroître avoir rien passé sous silence,*” when the patient lies comatose, stupid, and delirious ; when the neck tumefies and grows livid, and the hypochondria are tense and painful. These abscesses, he asserts, are more frequent on the convex than the concave side of the liver, and more generally deep-seated than superficial. My experience does not confirm any of those observations of the academician. His theory is, that in concussion, a greater quantity of

blood being sent to the head, a greater quantity is of course brought to the right auricle, presses on the inferior cava, and gives rise to accumulation in the liver. Pouteau thought, that, instead of a greater determination to the head, there was an obstruction there, and a congestion in the liver. Desault attributes it entirely to sympathy. Richerand accounts for it mechanically, and adduces proofs drawn from the effects of precipitating dead bodies into a deep pit meant for their reception at the hospital of St Louis, in which the liver has been torn to a considerable extent ; but I conceive that the circumstance of the liver being affected by a blow on the head, where the patient has not fallen, militates much against this explanation, and that we are still at a loss to trace the cause. The connection we know exists, but we are ignorant of the extent. It exists, though not uniformly, both in slight injuries of the scalp and severe fractures, and shows itself from the bilious erysipelatous tinge produced by a scratch on the teguments, to a deep-seated abscess. Of this, however, we are assured, that it is in the *primæ viæ* alone we can encounter those symptoms in their various shapes and degrees.

Protrusions of the brain, in many instances of them which I have seen succeeding to gunshot and sabre injuries, have not appeared to me to proceed solely and exclusively from any one cause, but to depend on several, sometimes acting singly,



and often in combination. The first and most simple cause has proceeded from actual violence, which has partially separated a portion of the cerebral mass, and has been obvious at the first dressing of the wound. The second has succeeded the removal of the support of the bony case, or the membranes, either by the original wound, by operation, or by subsequent inflammation and sloughing. The third class has been the effect of contusion, producing a morbid alteration of the brain itself,\* which either comes forth unaltered in appearance, or shoots out a bloody coagulum, arising from a ruptured vessel, or else pushes forth a new product, easily and safely separable by the knife, and quickly renewed, like fungus growth in other parts; or, lastly, proceeds from a gradual but often extensive breaking down of the brain into a bloody pulpy mass, which appears to issue forth by its own fluidity, unconnected with any propelling action of the blood-vessels.

Examinations after death, which is the general result of these cases, give ample proofs of the existence of protrusions from coagulated blood; and that proceeding from the substance of the brain itself is obvious, both during life, from the appearance of the substance protruded, and from the examinations

\* The disposition may exist without a fracture, as has been observed by Dr Thomson. *Vide* his Report, p. 57. Schmucker also notices this alteration of the brain; and it is not unfrequently met with after death in cases of gunshot injuries.

*post mortem*, when the loss can be detected in the cerebral mass within the skull, and the protruding part is observed to correspond with the deficiency in quantity and consistence. That a true and rapidly increasing fungus product is thrown out, is also evident by external inspection, and by observation on the dead subject, where the cerebral mass is found undiminished in size, notwithstanding the great quantities of fungus that have been cut off, torn away by the patient in fits of delirium, or spontaneously removed with the dressings.

The following is a curious case, in as much as it shows a combination of the different causes; it shows the violent injury which the part is capable of suffering from the accident, and from the escharotics and the knife of the surgeon; and it shows, finally, a depressed state of the circulation, which I have not had an opportunity of witnessing in any other instance.

#### CASE.

FRANCIS WILDE, 1st battalion 95th regiment, aged 28, was wounded by a musket-ball in the action of the 16th June 1815, at Quatre Bras. The ball struck the frontal bone, about an inch above the right eyebrow, and passed in a direction towards the squamosal suture of the temporal bone. He walked from the field of battle to Brussels by the help of two of his comrades. He was first seen

by a native surgeon, who cleaned and dilated the wound, and then sent him to the Jesuits' Hospital, where a longitudinal fracture was discovered, of an inch and a half long, and one broad, but no depression. The fractured bone was divided into four small pieces, which were easily picked away, leaving the surface of the dura mater uncovered. In dressing him on the third day, fully a dessert spoonful of the brain, and some loose splinters, were discharged, but he did not appear to suffer the slightest inconvenience. Indeed, after the most minute inquiries, both by Staff-surgeon Boggie and myself, we could detect no morbid symptoms, nor the smallest difference in his system from that of a man in perfect health, except that his pulse was reduced to the very extraordinary lowness of *thirty-six beats in a minute, and had been, by report, so low as thirty*. This exemption from existing disease did not lull us into security as to its eventual occurrence; and a most rigid abstinence was enjoined, with occasional purgings, and a direction that bleeding should be had again recourse to, (he had been bled three times before I saw him,) on the appearance of any threatening symptoms. On the 10th day, I found Wilde in his general health and appearance the same as before, with the exception of his pulse, which had risen to 46 beats. At this rate it continued for several days; and, on the 28th day, it had got up, by a very gradual and

progressive range, to 72.\* From this period he was observed to sleep a great deal, and he became very uneasy on being moved. No particular change occurred until the 38th day, when a greyish coloured spongy fungus, containing much coagulated blood, was observed to protrude from the wound, strangulated, as I may say, by the edges of the fracture, which had fairly formed a groove in it. He now complained of severe pains darting from ear to ear; both the pupils were dilated with a slight degree of strabismus in each eye; skin natural; tongue whitish; thirst urgent; appetite impaired; and there was occasional nausea and vomiting on taking his saline purgative draught, which he frequently used, to keep his bowels regular. The fungus, on the 40th day, notwithstanding the use of the red oxide of mercury, which had been employed to destroy it, had increased; the edges of the wound got puffy; he lay nearly comatose; the strabismus was greater than before; the left angle of the mouth was drawn upwards; the bowels were constipated, and the tongue was covered with a dry black crust; pulse 76, and soft. Some spiculæ of bone came away with the dressing, and the fungus poured out a quantity of blood. Towards the evening, the

\* The erect, or horizontal position, had no effect in altering the rate and number of the beats, which were always ascertained by two persons, one with a stop-watch, the other with a minute-glass.



symptoms became aggravated ; he moaned incessantly ; and on the dressing of the next day the protrusion was found to be to a very large size, nearly that of an egg. It pulsated very strongly. It was now determined to remove it by a stroke of the scalpel ; this was done, both on that day and the next, with very little consequent hemorrhage, and the part afterwards dressed with dry lint, and a small pasteboard compress. On examining the fungus, it was not as expected, and as it originally appeared to be, chiefly coagulium, but, from the feel and appearance, obviously brain itself. On the evening visit it was found necessary to tie his hands, to prevent him from tearing off the dressings, which he had done in the interval of the visits, and had dragged away with them a large piece of fungus which had rapidly protruded, although its removal by the knife was again tried. His general appearance, however, was better ; he was sensible to external impressions, and answered questions rationally, but complained of great pain on touching the wound. On the 42d day, although he tore off more of the fungus, he complained less of pain, and was quite sensible, knowing and conversing with the bystanders ; he had not that great appearance of anxiety as before. From this to the 45th day he got progressively worse ; the cerebral mass continued to flow out at each dressing, more fluid and bloody in appearance than before, and with obvious masses of coagulium ;

and at four o'clock P. M. he expired in the greatest apparent agony. I was naturally anxious to inspect the body, but a very few hours after death it became highly offensive ; and the young gentlemen were so much afraid that it would spoil altogether before my avocations permitted me to examine it, that they removed the head with the intention of throwing in an injection to trace the state of the vessels, and discover, if possible, the ruptured one, which we all along suspected. But before the necessary apparatus could be got, putrefaction advanced so rapidly, that it was determined to saw off the skull-cap, and place the brain in a basin of water for inspection. Professor Thomson and Dr Somerville assisted us. We found that the right hemisphere of the cerebral mass was reduced to a sort of bloody pulp, still retaining some shape of what it had been, but much diminished in size, and rendering it absolutely impossible to trace its organization. The left hemisphere, although obviously suffering from disease, was not so much affected, but was covered with a net-work of turgid vessels. \*

\* The remarkably rapid putrefaction of dead bodies after injuries of the head, has been long since observed, particularly by Hildanus, Cent. II. Obs. 25, 26, and by Morgagni, Epist. 51, Art. 57, and Epist. 52. Art. 15. I have had repeated opportunities of witnessing it. The same rapid putrefaction takes place in animals killed by lightning, and in those who have been killed in electrical experiments.

The mildest dressings, the cautious employment of pressure, the supporting the parts as much as possible by the approximation of the edges of the scalp, and avoiding every species of stimulus, are the means that I would recommend in these cases, in which, independent of the protrusion, there is often a serious injury of the entire mass of the cerebrum. Some surgeons have ventured on the use of escharotics; but I have always seen their employment succeeded by a great aggravation of the symptoms. They have been employed to a greater extent by the late Mr Hill of Dumfries than perhaps by any other British surgeon; his experience on this subject will be found well worth consulting, and is to be met with in his "Cases in Surgery." Mr Abernethy has thrown a brilliant and steady light upon this, as he has done upon every subject which he has enlarged on. An interesting paper by Crell, and another by Sand, "*De Fungo Cerebri*," is to be met with in the 1st vol. of the "*Disputationes Chirurgicæ* of Haller," and an inaugural dissertation of great merit has recently been published by Dr Abraham Solomons, "*De Cerebri Tumoribus*," Edinburgh, 1810. But perhaps the greatest mass of information that has ever been collected upon the point, is to be found in the admirable memoir of M. Louis, "*Sur les Tumeurs fongueuses de la Dure Mere*," in the 5th vol. of the *Memoirs of the Royal Academy of Surgery*.

Concussion, as well as compression, is a very frequent effect of fracture from shot or sabre wounds, and also from grazing round shot, and fragments of shell, earth, or stones. The diseases are frequently coexistent, and so often run into each other, or differ merely in degree, as to render it impossible in every case to lay down accurate distinctive marks between them. Neither the state of the pulse, the eye, the breathing, or the skin, are infallible guides ; we have an unerring one, however, in our most powerful remedy, if not to the precise nature of the case, at least to its most proper treatment,—I mean venesection ; and the younger surgeon who allows himself to be seduced by representations of the impropriety of copious bleeding in soldiers, will deprive himself of a most important and useful auxiliary when judiciously employed. No well informed man now-a-days, it is true, flies to the lancet the moment he hears of a wound of the head. He examines the case, and, from appearances, decides on the *immediate* necessity of abstracting that blood, which he well knows he must *ultimately* have recourse to when reaction takes place. If the concussion is so violent that the powers of life are absolutely sinking, to bleed instantly would be to destroy the patient. A glass of wine or of spirits poured down his throat will be the proper remedy. If the wound is not attended with great sinking, which is often fatal, then indeed the lancet and a brisk purgative are the ap-



propriate remedies, whether we call the affection concussion or not.

In the field, and throughout the whole practice of military surgery, venesection becomes, if possible, more necessary, because all the operations which may be ultimately called for, cannot, under the urgency and confusion of existing circumstances, be immediately performed; and the judicious use of blood-letting renders the deferring them less dangerous, and may even supersede the necessity of operations at all; an object, the value of which those will best appreciate, who know the frequent results of surgical operations in crowded hospitals.

The cordial and the depleting plans have each had their advocates, and some of our most able surgeons have been divided in their opinions. It has fallen to my lot, on several occasions, to see the plans contrasted on a large scale, where foreign and British surgeons have practised under the same roof; and the balance of success was so very decidedly in favour of the latter, as to confirm me in the propriety of abstaining from internal stimulants. But if the depressed state of the system, which immediately succeeds violent concussion, continues beyond its usual period, or is great in degree, and particularly if the pulse sinks on a cautious trial of the lancet, I have derived great benefit from applying a blister, using the warm bath, and administering guarded doses of pulv. ipec. com-

positus. If leeches can be procured, local bleeding on or near the site of the wound should never be omitted. In some cases of concussion general bleeding may be combined with the use of anti-spasmodics ; and there is a recent case where the use of an enema (which, from my own experience, I can recommend as powerful) of asafœtida, dissolved in water, had a most remarkable and instantaneous effect, preceded and accompanied by bleeding from the arm and temporal artery. \* But in no case should we lose sight of the necessity of guarding against inflammation, and watching its insidious approach with the most jealous caution.

A very curious example of pure concussion is given us by Schmucker, † in which a cannon ball took away the queue from the nape of a soldier's neck without injuring the integuments in any sensible degree. He continued in a complete state of stupor for many days, during which he was bled at least twenty times. Twenty-four grains of emetic tartar, given at short intervals, produced some stools, but no apparent inclination to vomit, after having suffered a relapse from having been moved prematurely on a march with the army. In the case of my friend Colonel T., although the neck of his hussar jacket was cut by a round shot at Wa-

\* *Vide* a case by Dr Thomson of Halifax, in *Edinburgh Medical and Surgical Journal*, Vol. X. page 12.

† In his *Chirurgische Wahrnehmungen*, Berlin, 1759, case 3d, p. 393.

terloo, the shirt torn, and the skin of the nape of the neck grazed, no one unfavourable symptom appeared, and he complained only of very acute pain and stiffness of the parts.

The necessity for a most cautious use of stimulants, even of the mildest kind, in all states and stages of injuries of the head, is rendered very clear by the following circumstance, mentioned to me by my friend Mr Vance. A transport, from the coast of Spain, ran into Portsmouth harbour, after a passage of four days, loaded with a promiscuous crowd of sick and wounded, embarked at Corunna, under deplorable circumstances of hurry, confusion, and want of every article of provisions, or medical comforts. This, which proved fatal to many, was the preservation of the lives of some. The naval hospital at Haslar was opened for the reception of these gallant men. Among the number, Mr Vance particularly remarked four with severe injuries of the head. They remained in the hospital waiting-room with their comrades till their names could be registered, and until they had given some account of themselves, in which they particularized their sufferings from cold and want of food. Those men had not been five hours in hospital, after getting some warm soup, and being bathed in tepid water, before violent reaction took place; inflammation set in, marked with delirium ferox, and their lives were preserved with

the greatest difficulty, by copious and repeated bleedings and purgatives.

Wounds of the head, which are not productive of the dreadful symptoms of concussion or compression, often lay the foundation of very troublesome spongy sores and indolent exfoliations, attended with extreme headachs, and sometimes amounting to inflammation of the brain or its meninges, and even to the formation of matter on or between these parts. The general principles applicable to inflamed parts, and to exfoliating bones, are applicable here, but requiring a promptness proportioned to the importance of the organ concerned. The throwing off of a scale is more rapid, and a granulating surface of new growth succeeds more frequently upon the bones of the skull after an injury producing exfoliation than on other bones; but if the symptoms do not soon yield, it would be manifestly improper to wait for exfoliation, when, by the simple application of the crown of the trephine, we can at once remove the source of irritation. On this point, as well as on the entire class of injuries, I cannot too often refer to the excellent Pott.\*

The tendency to relapse, left after injuries of the head have been got safely over, is very great, and demands for its prevention a rigorous system of abstinence of all kinds, little palatable to mili-

\* See particularly his 10th Case.



tary patients. Slow as the brain is, in some instances, to take on a diseased action, it is amazingly irritable in others. Among a great variety of accidents of this kind, I was most particularly struck by the following case, of which, by the kindness of Staff-surgeon Dease, I acquired the history. Although by no means unusual, it is valuable, in as much as it shows the dangers of excess in the patient, and the great probability of relief from puncturing, not the investing membranes of the brain only, but even the brain itself.

#### CASE.

A YOUNG officer of the ——— regiment had his os frontis fractured, and a part of it removed at one of the decisive battles in the neighbourhood of the Pyrenees. The skill of his medical attendants carried him through the immediate effects of the injury, but his own social disposition led him, with the wound still open, to the society which frequented the coffee-rooms and the brothels of the city where our general hospital was at the time established. A return of all his symptoms, in a most aggravated form, was the speedy consequence, and death very shortly ensued. From the antecedent symptoms, the formation of an abscess in the brain was confidently predicted by Mr Dease, and the spot where it would most probably point, was even indicated by the appearance of the wound. A difference of opinion, springing no doubt from

most laudable anxiety for the patient's welfare, prevented the performance of any operation; although all acknowledged the safety of the measure on some occasions; and it was only after examination of the body, at which I was present, and the detection of a large abscess filled with purulent matter, mixed with some clots of blood, to the amount of four ounces, and within one-tenth of an inch of the surface of the brain, that the probable good effect of puncturing was demonstrated.

Schmucker gives a most interesting case, his 29th, p. 297, illustrative of this point, where a ball stuck in the os frontis of a soldier; the inner table was forced in on the dura mater; it was removed by the trepan, and some coagulated blood brought away; he did well until the nineteenth day, when the pulse began to intermit, the dura mater became raised, and seemed to have a fluid under it. He made a small puncture, and two ounces of a whitish lymph were immediately discharged by the opening. The puncture closed, and three days after, the membrane being again raised, he made a crucial incision, through which an ounce of whitish fluid was evacuated. He kept this open with sindons dipt in a stimulating balsam, and the patient recovered speedily.

It is not the casual escape of a few that should betray us into the most remote encouragement of a deviation from rigid regimen in our patients. Hundreds of soldiers have lost their lives by a child-

ish facility of the younger surgeons in allowing them extras, (as they are technically called,) that bane of health, and source of endless abuses in hospitals. I doubt much whether, upon the whole, the service would not be benefited by striking them off from the diet rolls altogether, and issuing them as medicines. The employment also of female servants is a measure, the utility of which is very questionable, particularly of that class that usually follows camps and hospitals. These persons are not only far less efficient than men, and less amenable to the rules of police, but sexually they are often extremely hurtful. \*

Whenever the symptoms of formation of matter, or effusion of blood, and consequent compression of the brain occur, if we hesitate as to the application of the trephine, we deprive ourselves of our only resource. That it has been often unnecessarily employed is very obvious; the numerous instances of escape, however, show clearly, that uncovering the brain is not so very dangerous as has been argued by some, especially at the part where an injury has been inflicted, and where there is a probable separation of the dura mater. But if due attention is paid in the first stages, (which it has been my object principally to enlarge on,) the number of those secondary, and but too often fatal cases, will be most materially diminished.

\* For a very remarkable case illustrative of this, vide Hildanus, Cent. 1. Obs. 19.

Counter fractures, or, more properly speaking, fractures not corresponding to the part struck, I have not so frequently met with in consequence of gunshot or sabre wounds, as in the accidents of civil life, by falls from heights, blows, &c. so common among workmen. Directions, as the eminent Pott observes, “ to be given on these subjects can be only and truly general ; all the rest must be left to the judgment of the surgeon, which judgment must be formed from the peculiar nature of each individual case.”

Schnucker very particularly dwells upon the appearance of pulsation in the uncovered brain, and has observed that it rose and fell more on some days than on others ; and this state of pulsation regulated his employment of the lancet. In the British army we have been guided more by other circumstances ; but the observation of the Prussian surgeon should not be forgotten ; neither should it be lost sight of, that position may have a great effect on the appearance of the brain, if the dura mater is removed ; for the depending posture, favourable to the accumulation of blood in its veins, often gives an appearance of turgescence in the living subject, and misleads as to the existence of inflammation, in our examination of the dead.

While I have given so many striking instances of either no ill effects whatever, or else a very slow approach of danger, and a remarkable retardation of its actual occurrence after sabre and musket wounds, I must not omit to mention



some of the more numerous instances where death occurs from those accidents ; but I should very much deceive the inexperienced reader, did I lay down separate or invariable characteristic symptoms of each of those causes of fatality, which all seem to have a combined share in the event :—rigors, fever, stupor, derangement of the alimentary canal, affection of the organs of sight, hearing, and speech, and general affection of the whole nervous system,—come on either in succession or together, and cut off the sufferer. On dissection, the rupture of blood-vessels, which can be traced by the knife or injection ; general oozing, not referable to any set of vessels ; the effusion of purulent matter ; the throwing out of layers of coagulable lymph ;—all afford instances of pressure from fluids ; while fractures and depressions ; separation of the inner table, without any displacement of the outer ; and a variety of extraneous bodies,—form the sources of pressure from solid matters. Besides these, abscesses, and even gangrene, are often detected making very extensive ravages in the body of the brain itself ; while sometimes it must be confessed that dissection fails in pointing out the immediate cause of the fatal event. Examinations after death have also frequently shown effusions of blood, fissures, and fractures, the existence of which had never been suspected during life ; but which, if affecting the basis of the cranium, are universally fatal. The symptoms of those cases are extremely equivocal,

and I am not aware of any which characterize them, more than any other serious injury of the same kind differently situated, except the effusion of brain from the external ear. The effusion of blood I have observed in several instances, but I have not found it necessarily fatal, which that of brain is. \*

The brain is not unfrequently injured, and some of its functions destroyed or impaired, by bullets passing below or close to its basis, and inflicting wounds belonging to the class of those of the face, though often supposed to be of the cranium itself. In all these cases, the prevention of inflammation and its consequences is the only rational attempt which we can make at cure.

Wounds of the head have attracted the attention of philosophers and physicians from the time of Hippocrates. His book on the subject is among the most interesting of his writings, and has greatly occupied the commentators, from Vidus Vidius, who published upon it at Paris in 1544, down to Bernardini Falcinelli, whose commentary appeared at Florence in 1658. The authors of the Arabian school were not behind the Greeks in their investigations, and Lanfranc, Guy de Chauliac, and De Vigo, followed in their steps. But an author, in whose work all the knowledge of his predecessors will be found concentrated, is Jacobus

\* Vide an account of Dr Thomson's communications upon this subject to the Chirurgical Society of Edinburgh, in the Edin. Med. and Surg. Journal, Vol. VIII. p. 250.

Berengarius, whose treatise “*De Fractura Cranii*” was published at Bologna in 1513, and has since gone through a variety of editions. It is to the moderns, however; to Pott, Dease, O’Halloran, and Abernethy, in these islands, and to Petit, Quesnay, and Desault, in France, that we owe by far the most valuable parts of our knowledge; nor is the work of Schmucker, his “*Chirurgische Wahrnemungen*,” to be omitted. The cases and observations contained in it are the results of long practice with the Prussian army, and a perfect acquaintance with shot and sabre wounds, acquired in the field and at sieges. Many interesting cases of these injuries will also be found in a valuable paper by M. Bordenave, in the 2d Volume of the *Memoirs of the French Academy of Surgery*, and in the different volumes of the “*Journal de Medecine Militaire*,” edited by Dehorne, Paris, 1782, et ann. seq. and the “*Recueil des Observations de Medecine Militaire*,” edited by Richard de Hantesierck, Paris, 1766, et ann. seq. M. Larrey, and all the other French military writers, abound in cases and observations on this important subject.

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### INJURIES OF THE EYE.

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THE eyes suffer in various ways by gunshot wounds and explosions. The natural mobility of

the organ, the frequent use which the soldier is obliged to make of it, without varying the position of his body, and the different attitudes in which he is placed in the loading, discharging, or aiming his piece, occasion a great variety in the angles at which the ball strikes the eye and passes along its orbit. After an action we meet with one or both partially injured, or blown completely out, or the ball passing through the upper part of the nose and leaving an arch, or removing it altogether; sometimes it passes behind them, destroying their power, either by cutting the optic nerves at once, or causing their subsequent inflammation and thickening. An additional proof of the decussation of these nerves is afforded by the effects of gunshot wounds of the eye; for in many instances an injury by a ball inflicted in the neighbourhood of one, produces paralysis of the other. Sometimes the ball enters straight forward, destroys the organization of the eye, and lodges in a variety of parts, in the brain, the orbit, under the zygoma, or in the soft parts, and sometimes its course cannot be ascertained during life. Pierre Roussillier, of the 25th regiment of the line, in the service of Napoleon, was wounded on the 18th June at Waterloo. The ball entered the right eye; the left, though not in the slightest degree injured to appearance, was completely blind. Rare, however, are the cases where death does not follow all wounds, particularly small punctured ones, going



directly forward into the orbit, as this did. I felt under the zygoma and all along the neighbourhood of this poor fellow's wound, but in the puffy state of the parts could not detect the course of the ball. He himself was confident it had gone into his brain. He returned to France convalescent. Garangeot (*Traité des Operations*, Vol. III. Obs. 20.) gives us an interesting case from the lectures of Petit, in which a soldier received a wound towards the great angle of the eye. It was deemed but of little consequence, and healed under the common hospital treatment. The man expressed a wish to leave the hospital, although cautioned by the surgeon, and had scarcely reached the door, when he was seized with rigors, obliged to return, and died in two days. On dissection, the ball was found lodged under the sphenoid cells and the hole of the optic nerve. The effect on this man's sight is not mentioned.

In some cases the ball passes into the orbit without bursting the eye-ball, although the power of vision is totally lost. Of this I had a case at Elvas, which occurred during the siege of Badajoz. It struck me at the time, as illustrative of the mode in which, by the resilience of their coats distended with fluid, the blood-vessels often escape injury when balls pass close to them. A soldier of the 52d regiment was brought into the operation room at Elvas, some weeks after being

wounded, for the purpose of having a ball extracted which gave him excessive pain, impeded his respiration, and obstructed his deglutition ; it prevented his speaking distinctly, and kept up an irritation in his fauces, attended with constant flow of saliva, and a very frequent inclination to vomit. On examination, it was found to be lodged in the posterior part of the fauces, forming a tumour behind and nearly in contact with the velum pendulum. It had passed in at the internal canthus of the eye, fracturing the bone ; and, although blindness was the instant consequence, the globe of the eye was not destroyed ; and the remaining cicatrix and very inflamed state of the organ were the only proofs that an extraneous body had passed near it.

Balls occasionally take their course through the superciliary ridge, and often penetrate through the lower part of the orbital process, and go out under the zygomatic arch, or lodge in the antrum of Highmore, or in the nares ; or, finally, pass out through the palate and into the mouth, or externally at the throat. Of this kind seems to have been a case which made a great noise many years ago, and obtained insertion in the *Philosophical Transactions*. The ball entered by the right orbit, and passed inwards. After a variety of exfoliations from the wound, nose, and mouth, and the formation of several tumours about the jaw, it was at last cut out (after thirty years' residence in the parts)

near the *pomum Adami*.\* Strabismus is not an unfrequent occurrence from wounds of this kind so close to the neighbourhood of the eye, and from the passage of balls from one zygoma to another. I have observed also, but particularly in a French prisoner, Joseph Fleche, of the 51st regiment of the line, a fixed state of the eye balls of both eyes, indicating a paralytic affection of their muscles, with a dilatation of their pupils; the dilatation was permanent; but on some occasions, (not apparently connected with any external cause,) the globes of the eyes evinced a considerable share of motion; the sense of smell was entirely lost. No symptoms of injured brain followed this wound. But in a soldier of the 28th regiment, wounded in the same action, June 1815, and same manner, but more below the zygoma, the head was violently affected; the smell was instantly and permanently lost; the hearing was impaired; but the sight of the eyes remained perfect throughout the cure, and does so to this hour. A French prisoner, of the 63d regiment of the line, had a ball passed through the right eye in a direction straight inwards and lodged, site unknown. A total paralysis, both of the pupil and muscles of the *left* eye, ensued. In another, Dupré, of the 51st regiment of the line, the

\* *Vide* Phil. Trans. abridged, Vol. V. p. 204, or Vol. IV. p. 14, Part 2d, new abridgment. For a case of a ball lodged in the nares for 25 years, *vide* Ephem. Nat. Curios. Cent. 10. Observat. 80.

ball entered the right temple, at the upper part of the zygoma, and lodged. The sight of the eye was utterly destroyed, although the globe appeared quite perfect to a superficial observer. On looking carefully into it, the lower half of the pupil seemed to be separated from the upper by a transverse line formed by the edge of a floating mass, apparently coagulated blood. The upper half appeared as if occupied by an exudation of lymph. The pupil was so dilated, that scarce a trace of iris was to be seen ; it was barely marked by a coloured circular line.

Diplopia sometimes, though rarely, takes place from gunshot wounds in the neighbourhood of the eye. The following case occurred in a soldier of the 33d regiment at Waterloo :—

#### CASE.

A. B. received a wound from a musket-ball, which brushed along the root of the nose, and onwards towards the right eye-brow, but without producing any injury to the bone, and so little general derangement, that the wound healed in a very few days. Immediately on being struck by the ball, double vision took place. I did not see him until the wound was nearly healed. He then saw the double objects at the same moment, and both with equal distinctness. Nor did his shutting his eyes, and then suddenly opening and fixing them on the object, or viewing it in an ob-



lique direction, occasion any variation in the appearance. He had been, I believe, a very dissipated subject, and abstinence, with occasional emetics, and cold collyria, were recommended. In about two months the disease was removed, but on running into some excess in drinking, it returned again, and the wound burst out afresh ; a recurrence to a more rigid regimen perfected the cure in a fortnight, and he was discharged entirely from hospital.

Diplopia, and other derangements of vision, also take place in injuries of the head, where the eyes themselves are not at all originally affected. I have seen it in many cases of injuries of the head in various points, with and without depression of the bones, or inflammation of the brain, or meninges. In Mr Hill's cases, we have a very curious, though short account of it.\*—A man had been under his care for some time with a severe injury, affecting the head generally, but his friends, despairing of the possibility of saving his life, brought him home. Repeated attacks of fever, inflammation, and suppuration of the brain, took place. “ When the inflammation was in the *fore part*, the candle appeared double ; when *backward*, with a circle about it, but after the free eruption of the matter, the candle appeared single and distinct.”

\* Hill's Cases in Surgery, Case V. p. 108.

I have met with one or two cases of amaurosis from wounds of the supraorbital nerve ; the perfect division of the nerve produced no alleviation of the complaint, but, after some time, the eye partially recovered.

In the unfortunate injuries of this delicate organ, very painful consequences ensue, and fungi to a great size, and of a most irritable nature, occasionally protrude. I have seen many gallant men driven almost to desperation by the agony they suffered, which nothing but large and frequently repeated doses of laudanum could subdue. The means which I would recommend are : First, if the globe of the eye is irreparably injured, as in almost every case it is, at once to evacuate the accumulated humours by a free and deep incision. By this means, we sometimes are enabled to extract the bullet, if it lies in or near the orbit. The parts should then be covered with the lightest and mildest possible dressings, and with cold applications, although sometimes we find that warm fomentations, and sometimes cloths dipped in spirituous lotions, give most relief. Finely scraped lint applied dry, will, in the lesser degrees of fungous excrescences, serve to repress them ; but if they become troublesome, we must have recourse to a strong solution of nitrate of silver. If inflammation runs very high after one copious general bleeding, leeches should be applied, and continued, if the

abstraction of more blood is necessary. I am convinced that mischief, rather than good, has been often done in the inflammatory affections of this insulated organ, by profuse general blood-letting.

The bony circle, forming the exterior part of the orbit, is often the seat of gunshot injuries, particularly the supereiliary ridges, the frontal sinuses, and generally the whole of the bone in which they lie; and, I may here take occasion to confirm an observation made by the accurate Pott, as far as has come within my own experience, that the injuries of "this bone are, by no means, so commonly dangerous or fatal as those affecting other bones of the cranium." Universal experience has now pointed out the safety and facility of trepanning every part of it, including the sinuses, in which balls are frequently seen completely buried, with extensive depressions of the inner table, which nothing short of the operation can remove.

Almost all the systematic writers treat on the wounds of the eye incidentally. Paré has dedicated a chapter to them in his 10th Book. Cæsar Magatus, in his valuable work, "*De Rara Medicatione Vulnerum*," also treats on them; but Bohu, in his very useful little volume, "*De Renunciatione Vulnerum*," has not mentioned them; although in this work, and that of Magatus, already referred to, information on the injuries of almost every organ and part of the body may be met with. Ravaton and Percy give some observations upon the

wounds of the eye ; and a variety are accurately enumerated by Dr Thomson, in his " Report." I am not aware of any monograph upon the subject.

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### INJURIES OF THE EAR.

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THE ear is the subject of gunshot wounds as various as the eye, in their course and in their effects. The mastoid process is injured sometimes in its whole extent, and sometimes only partially brushed ; the balls, passing about it in every possible angle, and sometimes appearing even to enter the external meatus itself. At all events, injuring the bony circle primarily, and in its consequences implicating the more internal bony sides of the auditory canal, and small bones of the organ, in suppuration and caries. These cases are attended with more or less deafness, great pain, frequent spasmodic affections of the face, and an intolerable fetor in the discharge ; and sometimes followed by death from inflammation spreading to the brain. Open bowels, abstinence, and strict attention to cleanliness by tepid injections, are particularly called for on these occasions.

Paré gives a very short chapter in his 10th book on the incised wounds of the ear ; Hildanus gives some observations on the deafness produced by the explosion of ordnance ; and Sennertus dedicates the



5th chapter of his first book to the wounds of this organ. I am not aware of any special treatise on the subject.

As a measure of safety, which prudence dictates and experience fully justifies in every wound connected so nearly with the brain as those which I have been speaking of, a mild course of mercurial physic should never be omitted, with the rational view of completing the absorption of any effused fluids or depressed bony points that may still remain within the cavity of the skull, and lay the foundation of future mischief; and also to relieve the sympathizing viscera, particularly the liver, on the discharge of whose functions so much of the health of our patient depends, \*

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## INJURIES OF THE FACE.

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WOUNDS of the face attract our attention more particularly from the deformity with which they are attended, than from any peculiar danger consequent on them. Those from sabre cuts, although the most horrible on first appearance, yet, by the

\* See some valuable remarks on this subject, in 2d volume of Transactions of a Society for the improvement of Medical and Chirurgical Knowledge, by Sir Gilbert Blane; and Cases in the 4th volume of the Medico-Chirurgical Transactions, by Dr Hutchison.

judicious use of adhesive straps and sutures, and by the proper application of supporting bandages, are frequently healed without much disfiguring the patient, especially where the parotid duct is not divided. A most remarkable instance of this occurred to Captain De H—— at the battle of Waterloo. My friend Staff-surgeon Dease dressed him on the field, and sent him in to Brussels to my care. The wound was from a sabre, which struck him nearly across the eyes, one of which it destroyed, and cut obliquely inwards and downwards, so as to admit of a view of the pharynx. In the multiplicity of engagements I did not see him for several days, and not before a Belgian barber had cut out the ligatures and removed the straps by which the lower portion of his face was kept in position, and had stuffed the parts with charpie. This officer recovered, granulations sprouting up at all points, and the deformity is by no means so great as it was natural to apprehend it would have been. the parts having been again brought into apposition by straps and bandages, but with great pain to the patient, and consequent delirium. The hiatus was so great, that Mr Dease was on this occasion obliged to support the upper jaw by morsels of cork put into the mouth, in such a way as to act as fulera, but admitting of the passage of liquid nourishment. The cicatrix now forms one right line from ear to ear, the soft parts united, but the bones not. This

soft union occurs also sometimes in the lower jaw. Injuries from musket balls, although at first of little apparent consequence, are eventually productive of great and disgusting inconveniences; and those from fragments of shell or round shot often communicate their effects to the brain, particularly if fracturing the malar prominence and parts adjacent, while, if they injure the lower parts, the organs of speech and of mastication are seriously and sometimes irrecoverably affected.

Great secondary injury is produced by the frequent exfoliations of bone, and deep-seated formations of matter, occasioned by a musket ball passing through or shaking the bones of the nose, or penetrating the maxillary sinuses, the effect of which may be felt for years. The balls often get partially split and entangled among the irregular shaped bones forming the face and upper jaw, resisting all attempts at removing them for years, until they have produced by their irritation large puffy tumours, extensive ulceration, and caries in the bones, and sloughing of the mucous membranes which invest them. In all cases where it is at all possible, the extraction should be made *internally*, to obviate deformity. Spiculæ of bone will long remain after the ball is extracted, which give rise to great irritation in the fauces and nostrils, through both of which they for months continue to be discharged, affecting the organs of taste and smell in a very

unpleasant manner. \* Loosened teeth also form a great source of irritation, and should be removed as soon as possible. I have never seen the attempt to save them productive of any ultimate good. The tongue often suffers from the passage of balls through the mouth, or from bayonet thrusts, and will often heal without any bad consequence, if not too much interfered with by art. Indeed, it is astonishing how little beyond simple dressing, quiet, and abstinence, is required in the most serious-looking penetrating wounds about the mouth and cheeks. The elastic nature of the soft parts forming the cheeks, admit of their being brought into close apposition by art, even where there is a large destruction of them ; but it becomes a very different matter if the bone, particularly the lower jaw, is either simply fractured, or has sustained a loss of substance throughout. The powerful, opposite, and frequently excited action of the muscles inserted into it, render it difficult, if not impossible, to prevent great deformity.

In some horrid cases, where the lower jaw is swept away by a cannon shot, life has been preserved by the endeavours of art, aided by a sound constitution ; but, in general, the patient sinks under the accumulated tortures of his situation. † It

\* In the case of a general officer in which I was consulted for a circumstance of this kind, I recommended the use of prepared charcoal snuff, which was employed with considerable relief.

† M. Larrey's case of Louis Vauté is so curious and so amply illustrative of the powers of nature, seconded by art, that I



is still, however, our duty to try every expedient ; and, after the ragged parts and splinters of bone are removed, the vessels within reach secured, and the suppurating process fairly established, we may endeavour to assist nature, faithfully following any effort she may make to fill up the chasm, but without allowing ourselves to count upon a showy or complete cure. By strict attention in this way, I saw a horrid looking case, where nearly one-half of the face was carried away by a round shot at Waterloo, in very fair progress of contraction, under the care of my friend Staff-surgeon Roach.

The various nerves that may be injured in wounds of the face, give rise to a great variety of paralytic and spasmodic affections and distortions, which do not come within the power of art to remedy. I have seldom met hemorrhages about the face that were not very readily relieved by the ligature of the small vessels, or graduated pressure applied, either to the wound or along the artery implicated ; still less to observe any, requiring the experiment of tying the carotid trunk, although such necessity has occurred to others.\*

beg to refer to his book, now translated by Mr Waller, surgeon of the navy, p. 130, where the ingenious mode of feeding the patient and of covering his deformity afterwards, are fully shown.

\* *Vide* Medico-Chirurgical Transactions, Vol. VII. paper by Staff-surgeon Collier. I witnessed the cure, though not the operation. It appeared perfectly complete.

In injuries of the parotid duct I have in a few instances derived advantage from making the division complete by a clean incision across and into the mouth, and closely bringing together the edges of the wound on the outside of the cheek. The natural flow of the saliva into the mouth has rendered the wound on that side (with the occasional aid of a little lunar caustic) indisposed to fill up. We are, however, often disappointed in this fortunate result, and a constant dribbling, with depositions of tartar around the wound, succeeds. Pressure upon the duct, so as to obliterate it, or at least to obliterate its point, has been proposed, but the practice is very dubious; excruciating pain and immense swelling of the parotid gland, with a general œdema of the neighbouring parts, almost constantly succeeding. An ingenious proposal has been stated and practised by the French surgeons to prevent the uncleanly dribbling of saliva, viz. the obliteration of the secreting gland altogether, by compression. This, it is said, is done with perfect safety, and the other gland completely supplies its place by an increased secretion. I have never tried the experiment; but I doubt the fortitude of patients in general to bear the necessary pressure.\*

\* *Vide* Desault par Bichât, Tom. II. p. 218, and Gariot, *Traité des Maladies de la Bouche*, 8vo, Paris, 1805. The gland itself has been operated upon by Dr Palmer, *Vide* *Medico-Chirurgical Journal*, Vol. I. p. 457; and by Mr Goodlad, *Vide* *Medico-Chirurg. Trans.* Vol. VII. Part I. p. 112. For some va-

In injuries of the lower jaw-bone, if the fracture is not complete, little more need or can be done, than removing the splinters and loose teeth, and taking away exfoliations, to which it is particularly liable. If the bone is fairly divided into two portions, the best chance of avoiding great deformity, is to apply the lower jaw closely in contact with the upper, which, in this case, must be viewed in the light of a fixed splint, supporting the part by a properly adapted roller, with a compress over the fractured points, and giving the patient the strictest injunctions to keep his mouth closed. His food must be altogether fluid, and his wants and wishes conveyed on paper. Fragments of bone and teeth are sometimes driven far into the sound parts; and if the fauces or tonsils are engaged, great irritation follows. A very curious case of this kind is now before me, which I hope my friend, Staff-surgeon M'Leod of the York Hospital, will give more at large. An officer had the lower jaw fractured, and several teeth knocked out, at the storm of St Sebastian. After a variety of sufferings, he is now in perfect health, and serving in the army; but in the posterior part of his fauces there is lodged a substance, whether a fragment of jaw-bone, or a tooth, cannot be now determined, around which an extensive osseous

liable observations on the subject I would particularly recommend the study of Burns on the Surgical Anatomy of the Head and Neck, Edinburgh, 1811.

mass, perceptible to the eye, and to the probe, is thrown out. A recollection of Mr Hunter's experiments on the transplantation of teeth, incline me to the supposition, that a tooth is the nucleus of this deposition.

Paré gives a few short notices on wounds of the face, and its different parts, in his 10th book ; and Wiseman treats of them in his 5th. Ravaton gives some instances of external injuries cured ; and Deschamps, in the 3d Vol. of the *Journal de Medicine Militaire* ; and Bouillard, in the 4th Vol. of the same work, give two remarkable cases : the first of a transverse sabre wound, opening the frontal sinns and lachrymal canal ; the other of a longitudinal wound, from the same weapon splitting the face from the root of the nose to the bottom of the chin. Both those extensive wounds were healed by proper bandages, and adhesive straps, without the use of sutures. Simon published at Paris, in 1765, upon the diseases of the tongue, in which he gives an instance of gunshot injury of it. Pibrae, in the 3d Vol. of the *Memoirs of the Academy of Surgery*, proposes a species of pocket bandage for the wounds of the tongue, more curious than useful. In the same Vol. Duphenix, Morand, and Louis, give some excellent observations on the fistulæ of the salivary canals ; and in the 5th Vol. of that great work, Bordenave has given several instructive instances of injuries of these parts.



WOUNDS OF THE NECK.

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It is only from a consideration of the parts of the neck, as they form one complete and sympathizing whole, that we can derive any rational views of the symptoms that may occur from its injuries, or any satisfactory explanation of them after they have taken place. The close and intimate connection of the great vessels and nerves, and of the canals leading to the thorax and abdomen, are such, that separate views of their affections, however they may carry the appearance of minute accuracy along with them, are more the objects of speculative calculation in the closet, than the results of actual experience, and can seldom be of any practical utility in the field or hospital. Simple incised wounds on the back of the neck, although sometimes penetrating to a great depth, and even uncovering the vertebral arteries, are not beyond the reach of simple bandage, and retention by adhesive straps and sutures; feebleness of the extremities, particularly the lower, are a more frequent source of complaint in these cases than hemorrhage. In the simple superficial gunshot injuries, no peculiarity of treatment is required; wounds which penetrate are, however, productive of great distress, and very high degrees of inflammation, the immediate or consequent effects of

which spread far and deep, and, besides the immediate lesion, draw into sympathetic action all the adjacent parts. Hence arise restlessness, oppressed breathing, cough, nausea, and great irritability of stomach, with various nervous affections, as aphonia, hiccup, globus hystericus, and spasmodic twitchings of all the neighbouring parts, from general affection of the complicated and communicating nervous distributions throughout the cervical isthmus. Loss of power of the arm of the affected side, is also a very common occurrence in those cases, either instantaneously, or at a more remote period, as the cervical nerves going down to form the axillary plexus may be affected primarily, or at some time after the infliction of the wound. And all these symptoms are accompanied by severe hemorrhages, which are always violent, and but too often fatal, life being generally extinguished in one or two pulsations of the heart, if the great vessels are injured. But if the secondary, or still smaller class, pour forth their blood, their natural retraction, and the fainting of the patient admits of surgical aid, or so far subdues the disposition to subsequent inflammation, that life may be saved. I omit saying any thing on the wounds of the jugulars, or carotids; gunshot openings of them I hold to be so universally fatal, that any exceptions may be looked upon as merely serving to confirm the general rule. I shall not enter at large into all the varieties of wounds of

the neck ; but as the following case exhibits a combination of most of the circumstances that occur in severe gunshot wounds of the throat, I shall offer it as illustrative of the general doctrine, and the practice in those cases.

#### CASE.

My friend, Lieut.-Col. A. C. received a wound from a musket-ball on the evening of the 18th June, at Waterloo. The man who fired at him was so close, that he could perfectly well see him, the distance probably about 70 yards. On receiving the shot he instantly dropped, not, however, perfectly senseless, but very much stunned. He felt as if he had received *three* distinct wounds, the most severe of which he referred to the arm of the wounded side, the two others, of nearly similar severity, to his throat and stomach. He was carried to the rear, where a light dressing was applied by an hospital assistant, and a very copious bleeding employed. He was then sent into the city of Brussels, where he arrived at two in the morning. On his arrival I was called to see him expire ; and, truly, I did not suppose he could possibly survive till day-light. The ball had entered the sternal portion of the sterno-cleido-mastoideus of the left side, about an inch above its origin, and had passed inwards towards the thorax ; but no trace of its route could be discovered. The wound had obviously discharged an enormous quantity of blood, which also

gushed copiously from it at every effort to cough or vomit ; symptoms which recurred at intervals of ten minutes, and distressed him most severely ; and which had, as I afterwards found, taken place almost on the instant of his wound. His left arm hung nearly lifeless, with a pulse scarcely perceptible ; that at the sound arm was excessively quick, 120 in a minute, and feeble. I did not judge it prudent to do any thing for him that night ; and one of the assistant-surgeons of his own corps arriving next morning, in whom the greatest confidence could be placed, he was left in special charge of him, with directions, on any appearance of rising inflammation, to bleed copiously, and to keep his bowels open, and the skin perspirable. On the second day, when the bustle of the wounded coming in had somewhat subsided, I called upon him, and, much to my surprise, found him comparatively calm, sensible, and free from any pain in the wound ; but, with such an oppression about the scrobiculus cordis, and, indeed, all along the course of the diaphragm, that he urged me to cut for the ball, as he was certain, he said, it was the source of his pain. He even laid his finger upon a spot below the right scapula ; but after examining the part minutely, I could see no justifiable motive for hazarding an incision. He spat up a florid frothy blood very copiously, and the same issued occasionally from the wound. The efforts to vomit, and spasmodic catchings of the throat, with



globus and hiccup, were very severe. He had passed frequently and copiously, during my absence, a pale, limpid, inodorous urine ; his pulse, however, and his general appearance, were improved. During the course of this night, the pulse rose so high, and dyspnœa came on to such an extent, that twenty-four ounces of blood were taken from the arm. *Third day*, symptoms as before, the belly did not answer sufficiently to the enemata ordered, and he had, in consequence, a saline purgative draught, which operated moderately ; but towards evening the pulse rose, the pain became torturing, the dyspnœa almost suffocating, the nervous symptoms ran very high, and another copious bleeding of twenty-four ounces was had recourse to, with relief. On the *fourth day*, a new symptom was superadded ; his voice, which we had directed him not to employ, except on the most urgent occasions, was now lost altogether, and when addressed he pointed constantly to the course of the recurrent nerves, so as to convince us that an affection of them was the cause of this privation. His other symptoms, if not better, were certainly not worse. As he had not closed his eyes in sleep since the receipt of his wound, he had an anodyne this evening of tinct. opii gtt. xxv. vin. antim. gtt. xv. from which he had some refreshing slumber. On the *fifth day*, the cough and spitting of blood lessened much, and the retchings were less frequent ; urine copious and limpid ;

bowels free. On the morning visit of the *sixth day*, I found the hæmoptysis altogether gone ; but on the night of that day his sufferings were dreadful, the vomiting, dyspnœa, globus, and universal uneasiness and restlessness, rose to a pitch almost intolerable. His face was extremely flushed, and almost purple. His pulse got up to 130, hard, and bounding ; carotids throbbing violently. Thirty ounces of blood were taken during the night, but with little relief till towards morning, when I found him bathed in perspiration, which was encouraged by acid diluents, and the occasional exhibition of the liq. ammon. acet., with a few drops of vin. antim. He continued rather easier for the two succeeding days, when the symptoms becoming again violent, he was copiously bled to twenty-four ounces, from which he derived immediate ease. The blood on this, as on all the former occasions, exhibited a thick buffy coat. From this day his recovery of voice, strength, and appetite, and the removal of all his painful symptoms, became progressive, and only interrupted by occasional costiveness, or some trivial symptom, easily removed. His regimen was most rigidly abstemious, and his drinks diluent, and moderately acidulated. On the *thirtieth day*, while asleep, he was seized with a violent vomiting, which came on in convulsive jerks, by which such quantities of acrid bilious matter were thrown up, that he was nearly suffocated. His speech again became sud-

denly affected, and he uttered several incoherencies, of which, however, he was sensible ; and, as he himself expressed it, after his paroxysm was relieved, (by a draught of ether and tincture of opium in some aqua pimento,) “ his tongue would not obey his reason.” His arm, which had, after the first twenty-four hours, given him occasional uneasiness, and in which he felt a prickling sensation on the inner side, was particularly painful at the period of this spasmodic attack. It had been wrapped all along in flannel, and gentle friction had been employed to it ; but, upon examining it more particularly, it was found somewhat shrunk, and the fingers cold, and nearly insensible to pressure. At this period, the wound, which was simply covered with an emollient ointment, was perfectly healed ; but no trace of the ball could be discovered, although the Colonel positively averred that it was below the scapula. On the *thirty-first day*, the arm was not so painful ; his spirits were excellent ; his appetite craving, and he began to move about. In a few days he was able to visit his wounded brother officers in the neighbourhood ; and, before the expiration of July, he received leave of absence to proceed to England. By a late letter from him, I find that his health has gone on progressively improving.

The dressings on those occasions ought to be light, and the approach of inflammation most assiduously watched ; but I would recommend great

caution in the employment of antimonials, which we find so useful in other cases, where the rigid antiphlogistic plan is to be enforced. Their emetic or nauseating effects render their use at least ambiguous; and, although they had no unpleasant effect in Colonel C.'s case, I confess I should not use them again in such another.

Wounds of the larynx and trachea, if unconnected with any of the neighbouring parts, or not attended with much hemorrhage, are not peculiarly dangerous, although they are very slow at times in healing. In the upper part of the tube the cartilages sometimes become ulcerated, and throw out large fungous excrescences, and hoarseness, amounting almost to complete aphonia, takes place.

Emphysema is also a frequent, though not a dangerous symptom of wounds of this description; indeed, I have met with it oftener in wounds of the larynx and trachea than in those of the lungs, probably because the action of the muscles subservient to respiration, is exerted in such a manner as to send a current of air through the larynx, whence it is driven forcibly into the cellular substance. Simple puncture is, in those cases, the best remedy.

In some cases of injuries of the trachea, inflammation takes place in such a high degree as to spread by continuous sympathy to the lungs themselves, and produce very aggravated forms of pneu-



monic affection, and is often succeeded by a slow, wasting, and painful disease, in many points, and symptoms strongly resembling phthisis pulmonalis. Dissection, in those cases, shows inflammation, thickening, ulceration, and erosion of the cartilages, frequently with concretions resembling spongy bone thrown out on their surface. In a successful case of tracheotomy, lately performed at Portsmouth by Drs Denmark and Johnson, a large mass of this nature was ejected by coughing, and several of a similar kind were removed from the wound.

In dressing and examining these patients, we often find, when great delicacy is employed, that the irritation is invariably greater than when less ceremony is used. And it would be well always to keep this in view on applying remedies to the irritable internal parts about the throat. A moderate sized morsel of sponge immersed in our caustic solution, or whatever else we may use to the sore, will give infinitely less irritation than the more gentle, but more titillating camel hair pencil; and on the same principle, a lump of food conveyed by a tube or funnel, will be more easily sent into the stomach than a more delicate fluid injected by a siphon.

Wounds of the œsophagus in themselves are not peculiarly fatal; but, in common with all other wounds about the throat, the connection of that part with many other important organs, makes them

highly dangerous ; I have met with but a very small number, and I proposed treating them on the same principles as I would those of injuries of the intestinal canal. All were from gunshot, and all died from hemorrhage and severe irritation, long before I could try the use of the flexible tube, in supplying them with food. Emphysema took place in one of those cases.

#### CASE.

THE following highly interesting case of severed larynx, and wounded œsophagus, was communicated to me by my friend Dr Johnson of Portsmouth.

“ In the year 1805, while in sick quarters at Prince of Wales’s Island, in the East Indies, Mr Stewart an army-surgeon, and myself, were called up in the night to a man in the suburbs of George Town, who had just been wounded in a dreadful manner in the neck. On arriving at the spot, we found the poor fellow weltering in blood, with an extensive wound across the throat. Having secured two or three arteries, which were still throwing out blood every time that the man recruited a little, we examined the injury more accurately, and found, to our surprise, that the larynx was completely severed between the thyroid and cricoid cartilages ; and, moreover, that the œsophagus was laid open throughout half its calibre. We learned that this man, who was a Malay, had been playing

at a game of hazard till late at night with another Malay, from whom he had won several dollars. This so provoked his comrade's ire, that, following him to his abode, and marking the place where he lay down to sleep, which was before the door, in the open air, he first swallowed some glasses of arrac, and then leisurely cut his comrade's throat in the shocking manner related, with a large knife.

“ I confess we were at a loss what to do ; for, when we attempted to close the wound, he could not breathe at all. We, therefore, left it open, keeping his head reclining forward, and expecting that he would soon be suffocated. This did not happen, however, for he breathed very well through the wound ; but his greatest suffering proceeded from thirst, as every thing he attempted to swallow came through the opening. We tried to introduce liquids through a flexible tube, but we succeeded very badly, on account of the great irritability of the fances, trachea, and œsophagus. As there was great abundance of milk to be had, he was put into a bath of this fluid several times a day ; and glysters of various nutritious liquids were assiduously thrown up. By these means, he was entirely supported, during the space of 18 days, and nothing but common dressings were applied to the wound. At the end of this period, the œsophagus became retentive when liquids were taken ; and the breathing was beginning to be partly carried on through the mouth. From this time he

rapidly recovered, excepting a considerable loss of voice, and power of articulation."

A curious case is recorded by the learned and accurate Mr Percy, *Manuel de Chir. d'armée*, p. 118, which occurred at the battle of Fontenoy, where a ball had entered the œsophagus close to the thyroid cartilage. No search after it was ventured upon, but on the 16th day it was passed by stool. There was, at the late attack on Algiers, a seaman wounded through one of the scapulæ; the ball went directly inwards, and was passed by stool at the distance of some days afterwards. I did not see the case, but of the fact there is no doubt; the man was in Haslar hospital, and I believe even now survives. Did the ball, in this case, enter the œsophagus? or did it glide between the investing membranes of the thorax and abdomen, and penetrate the alimentary canal at a more distant point?

I am not acquainted with any monograph upon wounds of the neck. Paré employs the 29th chapter of his 10th book upon them. Wiseman gives only one case, and that of little interest; and Mr John Bell confines his observations to wounds, voluntarily inflicted and penetrating into the mouth. An interesting case of wound of the neck, succeeded by hemiplegia of the entire side, and another of gunshot wound of the throat, succeeded by paralysis and convulsions, is given by Forestus in his *Surgical Observations*. Another, with loss of motion in the arm from a wound of the neck, is



to be found in the *Edin. Med. Essays*, Vol. I. And in the *Med. Commentaries* by Dr Duncan, Vol. IV. p. 434, and Vol. VIII. p. 356, are two very interesting cases. Mursinna, one of Schmucker's successors, in his "*Medie. Chirurg. Beobachtungen*," relates a case of removal of the thyroid gland by a cannon ball; the patient survived 14 days, and died of dysentery. Richard de Hantescierck gives an interesting case in the "*Recueil des Observations*," &c. Vol. I. p. 48, where several nervous symptoms followed exposure to cold after a wound of the neck; and Verdrier, in the 8d vol. of the *Memoirs of the Academy*, p. 67, gives a very curious case of a wound of the throat, and another of the abdomen, in the same subject. Wounds of the œsophagus, as well as of the stomach and bowels, often remain open for indeterminate periods. I shall have to give some instances of the latter, when I come to observe upon wounds of the Abdomen. Triëen, in his "*Fasciculus Observationum*," Leyden, 1745, p. 40, gives us an instance of the œsophagus remaining open after a severe gunshot wound, in which also the larynx and trachea were implicated. Staff-surgeon Bruce gives a very interesting case of a wound of the œsophagus in the *Medico-Chirurgical Journal*, Vol. I, p. 369.

## OF WOUNDS OF THE THORAX.

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THE obscurity which attends wounds of the head, and renders their pathology so ambiguous, does not exist in an equal degree in those of the thorax. Its injuries are more cognizable to the senses ; the operations required for their relief have nothing peculiarly dangerous in them, and the necessity for performing them is often clearly indicated by the symptoms ; yet, with all those circumstances in favour of the patient, and in aid of the surgeon, the wounds of this division of the body are frequently as fatal as those of the head itself. Like them, too, they naturally divide themselves into those of the investing parts, and those of the parts contained ; but the leading point to be attended to, is the great and dangerous hemorrhages that may arise from them. Another point of resemblance between wounds of the thorax and head, is the lodgment of extraneous matters within their respective cavities, without producing immediate or eventual ill consequences. In the examinations of the bodies of soldiers who have died from those injuries, I have frequently found pieces of wadding, of clothes, spiculæ of bone, and balls, (and, in one case, some charpie used as a dressing,) either loose in various parts of the lungs, or lying in sacs, which the exertions of the constitution to

free itself, had thrown round them by the medium of coagulating lymph. In the more fortunate few who have recovered, those matters have been discharged from the wounds, or extracted from them by the surgeons. In some lucky cases, they have been ejected by the convulsive efforts to cough, which their irritation has occasioned. In speaking of extraneous bodies generally, I have shown how often a ball, striking the body, or a limb, will run round under the skin, and appear to penetrate right across the member or the cavity. By the deep-seated course which they sometimes take, the deception is rendered still greater. Thus, I have traced a ball by dissection, passing into the cavity of the thorax, making the circuit of the lungs, penetrating nearly opposite the point of entrance, and giving the appearance of the man being shot fairly across, while bloody sputa seemed to prove the fact, and, in reality, rendered the same measures, to a certain extent, as necessary as if the case had been literally as suspected. The bloody sputa, however, were only secondary, and neither so active or alarming as those which pour at once from the lungs when wounded. There is also another source of deception, as to the actual penetration of balls into the cavities or the limbs; this is, where they strike against a handkerchief, linen, cloth, &c. and are drawn out unperceived in its folds, a peculiarity which has not escaped Mr Larrey, who gives an interesting notice on it in the “*Bulletin de*

la Faculte de Medicine," Paris, 1815, No. 2. I have also given an instance of it in the preceding pages.

The following case proves, that a much larger mass than a bullet will pass even through the lungs, without producing death.

#### CASE.

A SOLDIER of the guards was wounded through the thorax at Waterloo, between the 3d and 4th ribs of the right side. On his arrival at Brussels, he was placed in an hospital and dressed by Assistant-surgeon Reid of the 25th regiment, who has favoured me with the case. Nothing remarkable occurred for the first five days; and the only singularity in the appearance of the wound was its large size, capable of admitting three fingers conically placed. Blood and air were freely discharged from it. On turning the man to examine him and renew the dressings, a tumour was discovered on the scapula, from which was extracted his breast-plate, about two-thirds of it rolled up by the force of the blow into a figure somewhat resembling a candle extinguisher, with the musket bullet contained within it; the other third was broken off, but had also passed through the wound and was extracted. This man survived for three weeks, with great hopes of his perfect recovery; but on some sudden gust of passion, to which he was very



liable, he tore the dressings off his wound one night, and was found dead the next morning. \*

Balls have been found in the body of the lungs after a residence of twenty years there, the patient preserving a perfect state of health, and no peculiarity of symptoms denoting their site.† There are on record instances where the ball has rolled about in the cavity on every motion of the body. Those cases are briefly stated by M. Percy, whose work is one of vast interest on the subject of extraneous bodies, and may be seen at large in *Mangetus*. ‡ But it must be observed, that these are deviations from the usual course of nature ; for the irritation of an extraneous body either leads to adhesive inflammation or thickening of the parts around it, and it is thus shut out, as it were, from the system ; or an involucrium of coagulable lymph is thrown out, vessels shoot into it, and a sac is formed.

Balls or bayonets passing along or through the muscles covering the chest and its vicinity, demand a peculiarity of attention, solely from the danger of inflammation spreading to the pleura, or the lungs and heart, or of troublesome abscesses form-

\* He was carried to the dead-house, and Mr Reid had no opportunity of inspecting the body. Drs Thomson and Somerville were shown the breastplate, but the man would not part with it, and after his death it was not to be found.

† *Vide* Percy, p. 125, and the authorities quoted by him.

‡ *Bibliotheca Chirurgica*, folio, Geneva, 1721.

ing. In this view the very slightest are interesting, and sometimes highly dangerous, particularly in cases disposed to pulmonic affections. When a ball has fractured one or more ribs, we must not be contented by enforcing a strict diet, but we must call in the lancet to our aid, and keep the bowels freely open with mild purgatives, and the skin in a perspirable state by antimonials and diluents, aiding our endeavours with a supporting bandage, and picking away any spiculæ of bone which are within our reach. In every injury of the chest, a firm elastic bandage is an indispensable assistant in the cure ; the motions of the ribs are not only restrained, but the parts are powerfully supported by its application ; if fracture has taken place in any of the bones, we have no other means so perfect of retaining them in their place ; if a slight degree of emphysema has occurred before we see the patient, we thus prevent its further diffusion ; and if we are called on before it takes place, we may prevent the occurrence altogether. The extent and tightness of this bandage should be such as to oblige the patient to perform respiration as much as possible, by the aid of the diaphragm and of the abdominal muscles ; if there is a wound, an opening ought to be left so as to permit of the usual dressings without removing the bandage. These, however, are our most favourable cases.

Next in order, though not in frequency, come wounds opening the cavity, but not injuring its con-

tents, which is comparatively a rare occurrence ; \* for a ball or bayonet that has passed through or between the resisting intercostal muscles or ribs, rarely is prevented from penetrating farther, particularly if it strikes in the intervals of the bone, and is driven directly forward. To discover whether the wound has injured the lungs or not, is a point which has given to the older surgeons great room for the employment of their ingenuity in devising possible cases, and has occasioned no small waste of time and wax-tapers in ascertaining the exit of air through the passage. A practical surgeon will require but little investigation ; bloody expectoration *immediately* on receiving the wound, and the terrible symptoms of dyspnœa, sense of stricture and suffocation, insupportable anxiety, and faintness, which succeed, soon enough discover the fact ; and if by good fortune no intimation is given in this way, happy is the surgeon, and thrice fortunate the patient.

The immediate danger in wounds of the lungs is either from debility from hemorrhage, or suffocation from the blood flowing into the air cells and cavity of the thorax. The effusion of air forming emphysema is also a troublesome, but taking

\* Among the extraordinary instances of recovery, there is a recent case where the shaft of a gig passed between the sternum and lungs. *Vide* "An Account of a Case of Recovery after an extraordinary accident," by William Maiden. 4to. London, 1812. Venesection to 12 lb. in ten days saved the patient.

it abstractedly, is not a dangerous symptom of those injuries ; neither is it by any means so frequent as has been supposed. The symptoms that I have now enumerated, whether single or in combination, may be deemed the primary effects of wounds of the thorax ; violent inflammatory affections of the lungs and the membranes, ever subject to relapse ; long and tedious suppurations, and exfoliations of the bones, are the secondary, and, though not so rapidly fatal, are often as certainly so as the others. Diseases which, although we cannot strictly call them pulmonary consumption, agree with them in many points, particularly in cough, emaciation, debility, and hectic, are often the consequences.

In whatever part of the thorax a ball, bayonet, or sabre strikes, our first object is to diminish the quantity of circulating blood, so vast a proportion of which passes through the contents of the cavity. On this the very existence of our patient depends ; and we cannot from reasoning *a priori* fix any bounds to the quantity to be taken, or determine the intervals at which it is to flow ; our practice in both respects must be governed by the effects. There lies a man with a wound of his chest ; the blood is oozing from the external orifice in a constant, though slow florid track ; in his frequent and painful efforts to cough, it is thrown up in frothy arterial mouthfuls, mixed with occasional clots ; his breathing is oppressed almost to suffocation ;



his pulse quick, weak, and fluttering ; his eyes are starting from their sockets ; his nostrils are distended in his efforts at relief by inspiration ; and his extremities are cold, and often tossed about in fruitless anguish. This wretched being must assuredly die if surgical aid is not promptly afforded him. The mode which should instantly be adopted in such a case is as follows. Without searching after balls or fragments of bone, or attempting to ascertain the precise track of the bayonet or the pike, or expatiating (as I have seen done by some young gentlemen fresh from their studies) upon the particular vessels or their branches which may be injured ; let the man lay quietly along, and lose from thirty to forty ounces of blood from his arm, by a large orifice. This done, we should remove the cloths or handkerchief which may have been hurriedly put over the wound to staunch the blood. If he has fainted during the bleeding, or if we find him in that state when we arrive, instead of administering any cordials to him, we should put our finger into the wound and extract every thing within reach, whether cloth, ball, iron, wood, splinters of bone, or clots of blood. If the orifice is not sufficiently large, we must not be afraid of making it moderately larger, by a cautious use of the probe pointed bistoury, or the sharp one, with a small morsel of wax on the end of it ; by this means we make way for the removal of extraneous bodies, and may possibly discover the

bleeding orifice of one of the intercostal arteries, which sometimes are cut, but *not at all so often* as speculative writers would lead us to believe. We now proceed to dress the wound itself. If it is gunshot, a light mild dressing will be sufficient ; but if incised, the lips of it should be closed at once ; and this treatment will be found to afford the most certain preventive to emphysema, future hemorrhage, or collections of matter. I scarcely recollect an instance where it was necessary to remove the adhesive straps, or (where it was gunshot) the usual dressings. We now lay the man down, and let him remain as quiet as possible, and in as cool and airy a spot of the barn, church, or hospital as we can find. He will often require no further aid ; but if the case is very severe, he will possibly lie for some hours in a state of comparative ease, till the vessels again pour forth their contents, and induce fresh spitting of bloody froth, and a repetition of all the symptoms of approaching suffocation. The lancet must again be had recourse to ; and if, by this management, repeated as often as circumstances demand, the patient survives the first twelve hours, hopes may begin to be entertained of his recovering the immediate effects of hemorrhage. In the after-treatment of a wound of the nature here described, we shall be considerably assisted by the aid of medicine ; but until the danger of immediate death from hemorrhage is over, we must not think of employing any

thing except depletion by the lancet ; it, and it only, can save the life of the wounded man.

This immediate closure of the wound has been recently adopted by M. Larrey with success. The practice is not novel. John de Vigo, in the tenth chapter of his third book, has given an account of it ; and Paré says that the practice is founded on reason and truth, if there is little or no blood poured forth into the cavity of the chest ; he, however, does not close the wound for the first two or three days, to prevent the accumulation of blood. La Motte closed all wounds of the chest most accurately with a tent ; hence, perhaps, it is, that, in the whole course of his work, he scarcely mentions emphysema. His history of the secret dressing, which consisted in sucking out the blood, and then closing the wound, is highly worthy of notice, and is given with great fidelity in his “ *Traité Complet de Chirurgie*,” Vol. III. p. 20, Paris edition of 1732. But Belloste seems to have done more practical good in this way than any other French surgeon. He argues strenuously and successfully against keeping the injuries of the chest open, in his “ *Chirurgien d’Hopital*,” and he sets a very valuable example to writers of a more modern date ; for, in a letter in explanation of Sancassani’s Italian translation of his work, he acknowledges his obligations to honest old Magatus, who wrote nearly one hundred years before him.

When the paroxysms of pain, the sense of suf-

location, and the return of hemorrhage, have become more moderate, and occur at longer intervals, we may have recourse to means of less immediate influence, and spare the lancet. In this view, the most powerful medicine that we can administer is the different preparations of digitalis, in such form as may best agree with the patient ; and if the pain and efforts to cough are severe and spasmodic, we must have recourse to the aid of opiates. To this course of medicine should be added a rigour of diet, amounting to the total prohibition of every thing solid, and admitting of fluids only of the mildest nature and least irritating quality ; and even those in small quantities and duly acidulated. Should we be fortunate enough to preserve our patient during the first six or seven days, a relaxation in this rigour may be cautiously admitted ; but a departure from the general plan, or an omission of bleeding on the rising of the symptoms, can only tend to accelerate the event that our efforts are designed to counteract. Mild saline purges, and an emollient enema, should be occasionally administered if required, and the patient kept in a state of the utmost quiet, and seclusion from all external impressions, and in a cool atmosphere.

In incised or punctured wounds, hemorrhage takes place instantaneously and profusely ; in gunshot wounds, if the intercostal artery or lungs are only brushed, or some of the more minute vessels opened, it is not so violent ; and we have rather to



prepare for what may occur on the separation of the eschars, than to combat any existing symptoms, the general tendency to pneumonic inflammation excepted. In the event of secondary bleeding from the lungs themselves, we are in possession of no external means for remedying it ; but whenever the tenaculum can be used to an intercostal artery injured by a ball, it should at once be applied, and the vessel secured by ligature. Unfortunately, however, we but too often are disappointed in finding the source of hemorrhage ; and here judicious pressure is our only resource. In some very slight injuries I have used the graduated compress with success ; but if the sloughing is extensive, nothing but the finger of an assistant, relieved as often as occasion may require, and pressing direct upon a compress placed along the course of the vessel, or so disposed as to operate upon its bleeding orifice, will be of any avail. In the advanced stages of this and all other hemorrhages, when the most imminent danger is impending, the face becomes pallid and cadaverous, and bedewed with a cold clammy sweat, spreading down the neck and chest, and giving the parts a soiled greasy appearance ; the lips are pale and quivering ; the eyes glazed and inanimate ; and the lachrymal caruncles remarkably sunk ; as the danger increases, spasmodic twitches pass across the face and the angles of the mouth ; the larynx is convulsively elevated and depressed ; efforts at vomiting come on, and general convul-

sion, or a sudden relaxation of the sphincters of the anus and bladder, announce the approach of immediate dissolution.

When I first entered on the practice of military surgery, the fear of emphysema actually haunted my hours of repose. This fear I have often since witnessed in young men fresh from their studies, and in their search after, and treatment of this accident, they have been bewildered and embarrassed beyond measure; the plain fact is, that it does not occur perhaps in one case of fifty, and that in a great proportion of those where it does take place, under judicious treatment it is trifling. Sometimes, however, it is indeed tremendous in appearance, and most distressing in reality.

In confined punctured wounds this crackling tumour is of more frequent occurrence than in free open ones, and spreads with great rapidity throughout all parts of the cellular texture, the palms of the hands and soles of the feet excepted. I have seen a case from a bayonet thrust in the breast, where all distinction of chin, neck, and chest were confounded in one general and unbroken surface; and it has been found that the air has entered the more condensed cellular substance, forming the envelopes of the different organs, and even into the substance of the viscera themselves. One proper application of the scalpel would have prevented it all.

The treatment of general diffusion of air has been supposed to have remained in obscurity un-

til the time of Dr William Hunter, who has given a description of emphysema, like every thing else he has touched upon, of great elegance and correctness ; and who has performed and recommended the only and very natural remedy of letting the air escape by incision. \* But to go no farther back, the father of British military surgery says, † “ A footman was wounded in the left side ; he coughed blood, and discharged much by the wound. Some few days after a tumour arising about the wound, I gave him a visit, and felt the swelled part crackle under my fingers. Concluding it wind got out from the cavity within the thorax, I made an incision into the swelling about an inch long, by which the wind was discharged.”

In the case of effusion of air into one side of the thorax, or into one sac of the pleura, the quantity must depend upon the greater or less adhesion of the wounded lungs to the costal surface,—a circumstance which is so frequent as to be scarcely looked upon as morbid ; and in whatever proportion the effusion may be, the wounded lung is incapable of perfectly performing its functions ; did it dilate and contract by the inhalation and expiration of air, it never could heal at all. Fortunately it lies for the most part sunk, and always quiescent ; and when the wound, in its parenchymatous substance, coalesces, it gradually extends so

\* Vide Medical Observations and Enquiries, Vol. II.

† Wiseman's Eight Chirurgical Treatises, fol. ed. London, 1705, p. 349, Observat. 4th.

as to fill, as it originally did, the side of the thorax to which it belongs. Whenever the orifice in the tegument is open, the air has a free passage through it, and continues to be forced out at every attempt at expiration, until the process of adhesion has taken place, if not prevented by art. If the lung lies collapsed at the bottom of the thoracic cavity, and that the external wound is healed up before it has resumed its natural inflated state, any small portion of air that may remain within is soon decomposed or absorbed. In many cases, however, where adhesion exists, or has subsequently taken place between the wounded lung and the thoracic pleura, air in small quantities continues to be discharged through the external orifice, until it is perfectly healed, (whenever the dressings are removed,) without any serious inconvenience to the patient.

The sinking of the lung is not an uniform consequence of a penetrating wound of the thorax. We have sometimes ocular proof of this, not only by the close contact in which the lungs lie to the wound, discoverable at first sight, but by protrusions which occasionally happen, and which, in the hands of the older surgeons, were removed by the knife,—a practice now rejected, and gentle pressure substituted. These facts are still further illustrated and confirmed by the observations of Mr Abernethy on the subject,\* and the

\* Works, Vol. II. On Emphysema.



experiments of Messrs Hewson and Littre in the respective Memoirs of the Academy of Surgery at Paris, and of the Medical Society of London. When this sunk state of the lung occurs, it obviously reduces a man to half his usual allowance of air ; it is, therefore, though not necessarily fatal, a very hardy act of a surgeon who deliberately runs the risk of depriving him of the other, by puncturing the sound side of the thorax. That the opening both sides of the thorax at once has been fatal in man, experience has proved, and this when the opening was made, both by accident and with a curative intention ; it must be confessed, however, that with all the experiments and facts before us, there is still an ambiguity in the “ philosophy of emphysema,” to use a term of Mr John Bell’s, hitherto unravelled, notwithstanding his illustrations of the point. From experiments on brutes we derive no satisfactory elucidation, for in some, where incisions on each side have been made through the intercostal muscles, much greater than the natural passage of the air, the lungs, so far from collapsing, have puffed out, the animal has lived, and in ten days ran about as well as ever ; and in our own species, the recoveries from wounds of the thorax on both sides, larger than the orifice of the glottis, dangerous as they are, are not a few.

The distressing state of the respiration consequent on general emphysema has led to a great anxiety on the part of surgeons to remove it, and,

where it has not been allowed to proceed too far, incision or punctures, cautiously employed, will effectually produce the evacuation of the air, and afford great relief to the patient. The accident, however, can seldom proceed to any great length with the proper use of the preventing bandage, and the closing of the wound at once, as already recommended, together with a free incision of the puffy tumour on its first appearance, as practised by Wiseman.

A still greater anxiety has existed on the subject of the air contained within the sac of the pleura, and numberless means have been proposed and adopted for its removal; it was long customary to take advantage of the interval between the termination of the expiration and the commencement of the effort to inspire, and then to form a valve of the teguments, as recommended for its expulsion by the writers of systems of surgery; but I have met with so many instances in which the patient did well, by closing the wound at once, and without ceremony, by a bit of adhesive plaster and the preventing bandage, that I have left all attempt at extracting air, aside entirely. Sometimes, indeed, it occurs, that an officer has some confused notions of respiration and of the supposed state of the lungs from wounds; and having unfortunately heard of their being compared to a pair of bellows, insists upon the necessity of great nicety and caution in preventing the

accumulation, and in effecting the expulsion, of air, by the application of air-pumps, &c. &c. I know one instance where death had very nearly ensued from gratifying the wishes of a *philosophic General* in a whim of this kind ; but if cautiously done, and that it amuses the patient or his friends, I would by no means rigorously forbid it. Mr Abernethy shows, that the air-pump may be employed without harm, if not with advantage ; but the blowing wind instruments, by way of puffing out the lungs and forcing the air before them, is worse than useless ; the attempts are highly hurtful. Fortunately they are now scarcely recollected, and the army surgeons of the present day are quite convinced, that when their patients are capable of performing such feats, they may discontinue their attendance.

Emphysema, on some occasions, is of a secondary nature, and very obscure in its history and progress. A case, curious, difficult, and important in all its details, occurred in the military hospital in Edinburgh Castle some short time since, with which my friend Dr Thomson has kindly furnished me, and which I shall briefly state.

#### CASE.

GEORGE GUNN, 93d regiment, was wounded at the attack of New Orleans, on January 8, 1815, by a rifle bullet, while in the act of firing his musket. The bullet entered on the left side, a little above and behind the articulation of the clavicle

with the scapula, and, anterior to the edge of the trapezius muscle, passed apparently across the back, and was cut out about forty-eight hours afterwards from below and behind the acromion process of the right side, having attached to it a splinter of bone about an inch in length. About ten minutes after receiving the wound, blood flowed copiously from the mouth on turning from side to side, and was occasionally brought up by hawking or coughing slightly. Hæmoptysis and acute pain of the left side of the chest supervened, which continued about three weeks, and for which he was twice copiously bled. Immediately, or soon after the wound was received, air was discharged from the orifice, and continued to be so while it remained open, with so much force as to drive off the dressings. In about two months the constitutional symptoms which supervened had abated, and he gained flesh and strength; and although, while the orifice of the wound continued open, and allowed the air to escape, his respiration was comparatively easy; yet, on exerting himself, he was always affected with oppression and difficulty in breathing. During this time he continued under the care of the American surgeons, but afterwards returned to England, and was received into Chatham hospital in the beginning of June. The external wounds, which had discharged while open several small spiculæ of bone, had healed up a short time before his arrival. Some time after, on using the dumb bells for the



removal of a stiffness in the shoulder, air was forced from the chest among the soft parts on the left side of the neck, and the posterior part of the shoulder, and was easily recognized by the emphysematous crepitus. This spread considerably, became painful on pressure, and his breathing was difficult, and attended with great pain in the left side of his chest. He was bled copiously and repeatedly during the period of this affection, which occurred in November, and an incision was made into the swelling, a little behind the entrance of the ball, by which a large quantity of air and purulent matter were discharged, and the patient was almost instantaneously relieved. The incision continued to discharge air and pus for about two months, when it healed, and his health being much improved, he was discharged. At the expiration of a month, air again began to be forced among the soft parts with the same crepitus as before, and a recurrence of dyspnœa and pain. He was taken into the Edinburgh Infirmary for these complaints, and, being relieved, went to the Highlands; but, his complaint again returning, he was, in the beginning of July, admitted into the Depot Hospital.

Thus far the account is derived from himself, and from inquiries among the medical gentlemen who attended him. The following is the sum of the reports made upon him in the Depot Hospital: When he coughs or shuts the glottis, and makes an effort to expire, a sudden croaking noise

is produced, which can be heard at a considerable distance, and, on placing the hand at the root of the neck at these times, the soft parts are felt to be suddenly distended, and to communicate a feeling of crepitation, which continues at all times to a greater or lesser degree in the neighbourhood of the wound. This noise and the accompanying escape of air can be prevented by pressure with the point of the finger in the course of the first rib, a little above and nearer to the spine than the cicatrix of the original wound. He has laboured under dyspnœa, with severe cough and expectoration of mucus, streaked with blood. The dyspnœa is much aggravated by the slightest exertion, and he frequently complains of pain in the left side, as if produced by a cord drawn tight from the shoulder to the lowermost rib of that side. The position in which he lies easiest is on his back, with his head and shoulders a little raised. The left side of the chest appears enlarged, and emits, on being struck, a sound distinctly more hollow than the right. His pectoral symptoms are always aggravated in damp foggy weather. His flesh since his admission has wasted, his strength has decayed, and he has been in a state approaching to hectic fever. Opiates have been administered, and occasional blisters applied with temporary relief. An incision into the swelling has also been made at the root of the neck, but only a small quantity of air was discharged, and little relief obtained.

Under all these unfavourable circumstances, Gunn sunk apace, and died hectic. The following were the appearances on dissection : On opening the chest, that cavity appeared to be considerably diminished, and the lungs on both sides were found adhering very firmly to the pleura costalis. The consistence of those organs was firmer than usual ; and, when cut into, their air cells appeared to be almost obliterated. The ramifications of the bronchiæ appeared to be filled with puriform mucus. At the upper and posterior part of the left side of the thorax, a cavity was found existing between the surfaces of the pleura pulmonalis, and costalis, capable of containing from 10 to 12 cubic inches of air. The inner surface of this cavity was lined with a thick firm membrane of coagulable lymph, particularly strong in the place where the lungs adhered to the parietes of the chest ; it contained only a small quantity of pus, which seemed to have been secreted chiefly from the ulcerated surface of the lungs, forming the parietes of this cavity. Two small openings were observable at the upper part of the cavity, penetrating through the pleura costalis, between the 2d and 3d ribs, and communicating with an abscess which existed in the upper and back part of the shoulder. It was obvious, that the second rib, a small portion of which was found bare, had been fractured by the bullet which inflicted the wound, and that a considerable quantity of callus had been thrown out on the reunion of

the fracture. The abscess over the shoulder was immediately under the skin and cellular membrane, and extended several inches backwards and downwards from the external wound. No distinct marks could be seen of the course of the ball.

After the extraction of extraneous matters, and the cessation of hemorrhage, it is still a question among some surgeons, whether wounds of the thorax should be dressed simply and lightly, or kept artificially open by the introduction of lint in the form of tents, &c. and of metallic canulas for allowing the exit of putrid blood, matter, and air. From my own experience, I have no hesitation in giving the preference to mild easy dressings, where it becomes necessary, from the formation of extensive collections of purulent matter, or bloody sanies, to keep the wound at all open. If the patient is placed in a proper position, that is, with the wound in a dependant posture, (and, in general, he lies by choice on the affected side,) the exit of effused fluids is not necessarily impeded. If they exist in large quantity, the wound is effectually prevented from closing, by the state of general irritation in which the system is kept by their effusion, and by their pressure on the lungs. If the flow is so minute as to admit of the union of the wound, the quantity effused is within the power of the absorbents to remove, and will produce no constitutional effects. I have seen, among foreign surgeons, tents and canulas so long continued, as to give rise to the very



symptoms they were meant to remove, and absolutely to become necessary to the patient's constitution ; while, in our own hospitals, where they are very little employed, I have never seen the closing of the wounds followed by ill effects. The case, however, becomes very different, when, from unabsorbed blood, or a wide spread pulmonic or pleuritic inflammation, a true empyema, or fluid collection, is secondarily formed ; or when, after all the dangers of the first stage are happily subdued, irregular chills, succeeded by great oppression of breathing, difficulty of lying on the opposite side, restlessness, œdema, and distortion of the chest, take place, and the propriety and strong necessity of performing the paracentesis is obvious. But, even here, keeping the wound open for any length of time by a canula, is a practice so little followed by the generality of British surgeons, that I am inclined to hesitate upon its necessity. I have contented myself with the application of a little lint, not so closely pressed in as to confine the discharge forcibly, and gradually diminished as the discharge has lessened. \*

If the symptoms of effusion of purulent matter succeed the original wound within a short period, the site of the injury, as chosen by some surgeons,

\* Under certain circumstances, the inquiry has been thought worth prosecuting, and, from the source of the opinion, is well worth trying. *Vide* "Report on the Hospitals in Belgium," p. 90.

is the most proper point of puncture. If the empyema is formed at a more distant period, the spot of election, as it is called, or between the 6th and 7th true ribs, is preferred. I should recommend a point considerably below the original wound, as adhesions, either general or partial, are apt to form in its neighbourhood. I have observed great relief to follow this operation ; but I have also seen a removal of all the pulmonic symptoms take place, and death very frequently ensue shortly after the puncture. In the examination of some of the bodies, I have met with abscesses in the very substance of the lungs, completely out of the reach of any operation, and not indicated by any peculiarity of symptoms during life.

Nature sometimes makes an effort for the removal of the fluids effused in cases of empyema, by distant channels, but the instances are rare, and not often successful. M. Richard De Hautescierck, in the *Collection of Cases from the French military hospitals*, edited by him, gives an highly interesting instance where the evacuation of a large quantity of purulent matter, by expectoration, by stool, and by urine, relieved an extensive empyema, which had succeeded a wound of the breast. A case somewhat analogous occurred at Brussels, where a French prisoner was wounded by a musket ball, which entered the thorax between the 8th and 9th ribs, at the distance of two inches from the vertebra, and lodged internally, but in what situation was never afterwards

known, although some pains were taken to discover its course, which was conjectured to have been through the diaphragm, for the dissection showed an hernia of the stomach, through that septum, into the thoracic cavity. This man lived from the 18th June, the day of his wound, until the 1st of November, when he died hectic. He had had a discharge of about a pint of purulent matter daily from the external wound, but it suddenly ceased, and the stools became very frequent, with a large commixture of pus, some time before his death. The thoracic cavity exhibited only a slight ulceration on the surface of the lungs, at the entrance of the ball, and a small sac, containing a very little matter, similar to what was mixed with his stools during life.

I have never had an opportunity of examining the lungs after recovery from a severe wound. Where death has occurred after recent slight wounds, thickenings, adhesions, and the other usual consequences of inflammation, are observed ; but Sir Everard Home has given us the appearances on dissection, after a lapse of 32 years ; in a paper in the 2d Vol. of the *Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge*, p. 169, which is highly interesting. An induration of the substance of the lungs was formed wherever the ball had passed, its entrance was readily discovered by a cicatrix, the membrane at that part being thinner than usual, and having a

puckered appearance, which terminated in a central point. This part of the lungs had not the slightest adhesion to the pleura, but was in its natural detached state. The portion of lungs above the course of the ball contained serum, and not air : it sunk in water, but was not contracted in size : it had no communication with the bronchia, the adhesive inflammation having consolidated all the parts above the line through which it passed.

I should be unwilling to lull either a patient or a surgeon into a false security, or to underrate the real dangers of any case ; but I have seen so many wounds, both from pike and sabre thrusts, and from gunshot of the thorax, do well ultimately, that I cannot but hold out great hopes where the third day has been safely got over ; for, though occasional hæmoptysis may come on, at almost any period during a cure, and its approach can neither be entirely prevented nor anticipated, the more deadly hemorrhages are usually within the first 48 hours ; and yet, to this alarming symptom, when within moderate bounds, the safety of the sufferer is often due. I have met with many cases, where, no surgeon being within reach, the spontaneous and unchecked hemorrhage has saved the patient's life ; no attempt at surgical treatment, except a very clumsy one by the patient or his brother soldiers, of applying rags or handkerchiefs to the wound, having ever been made. The bleeding has ceased spontaneously, the wound has closed,



and any extravasation within the thorax of either blood or air, has been absorbed. I could produce a great mass of evidence upon this subject ; but I shall confine myself to one case, which will sufficiently illustrate the point.

#### CASE.

“ GEORGE HARMAN, aged 33, now hospital-serjeant of the 10th Hussars, received a wound through the lungs from the thrust of a sword, in an affair with some French cavalry near Morales, in Spain, on the 2d June 1813. The sword entered the thorax behind, close to the basis of the right scapula, about the middle of its margin, and the point came out on the edge of the sternum, betwixt the articulations of the 3d and 4th ribs of the same side. He immediately fell from his horse, and soon fainted from loss of blood. In a short time he recovered, and had power to raise himself, and to sit up on the side of the road where he fell. In his removal to the village of Morales, about one hour and half afterwards, he again fainted from returning hemorrhage. When he had remained quiet a short time the hemorrhage nearly ceased.

“ I examined the wounds, (says Assistant-Surgeon Rogers, who has favoured me with the case,) and found that situated near the scapula rather more than an inch in extent ; that in front was scarcely half an inch. On inspiration, the blood

was thrown out from the posterior wound to the distance of several inches, in drops, so as to sprinkle my face when examining it ; it was also forced out of the anterior wound in a frothy state. Blood was thrown up by coughing ; the pulse was barely perceptible ; a cold sweat had broken out ; he was extremely faint, felt great anxiety, and complained of much pain in the chest ; no appearance of emphysema at either wound. The edges of the wounds were united with adhesive plaster, and covered with a compress of lint, and a bandage applied. This was about three o'clock. At six in the evening the pulse had risen a little, the pain in the chest had increased, but no further hemorrhage had occurred. At nine o'clock, there had been a return of hemorrhage, not very great, and it had now stopped ; the pulse continued much the same. At six in the morning of the 3d, I found he had passed a very restless night, but without any return of hemorrhage ; his pulse was quick and small ; pain in the chest remained the same ; respiration more difficult. At nine o'clock, no change of symptoms ; the bandage and dressings had become loosened ; no emphysema round the larger wound ; the edges of the smaller one were rather puffed ; but the little tumefaction which appeared proceeded chiefly from blood extravasated. The wounds were again dressed, and I left him in charge of Mr Pulstord, Assistant Surgeon of the 18th Hussars, to be removed to the general hospi-

tal at Toro. He now (January 1817) feels no inconvenience on moderate exercise ; but running, or any violent exertion, causes quick and painful respiration. I have one other remark to make on his present state. If the finger be applied to the site of the posterior wound, a singular vibration is very perceptible when he speaks, confined immediately to the spot. If it be argued that the sword did not penetrate through the chest, but that the wounds were by separate thrusts, I can speak positively to the contrary. This being the first time we met the French cavalry, curiosity led me forward with the squadron which charged. I was close in their rear, and saw this man wounded *after the enemy were broken*, being scarcely twenty yards from him at the time." So far Mr Rogers ; and I am myself enabled to add the following fact. When I took charge of the hospital at Toro, on the 9th of the month, seven days after the action, I found Harman, who was an active acute man, giving every possible assistance to the other wounded, both English and French, and performing the duties of an hospital serjeant ; no other dressing had been applied to the wound but a slip of adhesive plaster ; and no morbid appearance whatever had taken place. He had suffered a convulsive fit of vomiting on two occasions after the wound was healed, without any apparent cause, in which he had ejected a large quantity of bile. He had another of those attacks some months after, when the diaphragm was se-

verely affected with spasm ; but his general health when I saw him a few months ago was excellent.

Injuries of a most serious nature are inflicted by wounds in the upper and back part of the thorax without entering its cavity ; but which produce dreadful laceration of the muscles, splintered fractures of the clavicles and scapula, and profuse hemorrhage from the arteries running along those bones.

The injuries of the scapula itself are not of a very serious nature. Balls make a clean passage through its broad plate, and the splinters occasioned by them are easily removed ; nor are the simple fractures of the clavicle of great consequence abstractedly ; but I have seen some of the most tremendous wounds in which they have been implicated, and the inflammation and sloughing disposition spreading from them to the thoracic viscera and to the shoulder-joint, have been productive of protracted tortures to the sufferer, rendering life a very dubious blessing indeed.\* The immediate preservation of existence has, in the fortunate cases, certainly depended on the profuse loss of blood ; and the antiphlogistic regimen, with the utmost simplicity of dressing, has perfected the recovery.

\* A very remarkable case is noticed in the Edin. Med. Jour. Vol. II. p. 140, communicated by Dr Halliday, surgeon to the forces, where a 24 pound shot fractured the bone extensively, exposing the lungs and pericardium, yet the patient recovered.



The following appears to me an interesting case :

#### CASE.

LIEUT.-COLONEL H. received a grape shot of eight ounces weight on the day of Waterloo, just as the action was decided. The ball entered precisely under the centre of the clavicle of the left side ; raised the periosteum into a few small floeculi, and passed through the spine of the scapula close to its neck, lodging between the skin and his flannel waistcoat. Profuse hemorrhage, incalculable as to quantity, but designated by his servant and the surrounding soldiers, who had seen many hard fought days, as “ *enormous beyond example,*” instantly took place. He lay for dead for some time. On his recovery he found himself in the hands of a foreign surgeon at a village adjacent to the field, faint, but collected ; his arm numbed and immoveable, but very sensible to pain when touched. I need scarcely say that he had been in extreme danger, when the assistant-surgeon of his regiment joined him, shortly after his wound. When he was placed under my superintendence, on the 9th day, suppuration was fully established ; and, on removing the dressings, some few splinters appeared around both the sternal and dorsal aspects of the wound. I was very curious to see the state of the artery ; it lay awfully pulsating *in situ*, bare for about two inches in length, or I should rather say *unconnected* ; for its surface was studded with healthy granulations of unequal size, from a pin's

head to that of a pea ; the plexus of nerves was bedded in granulations ; the arm was stiff, and all voluntary influence over it gone ; and the slightest motion of it in dressing the parts was attended with exquisite torture. The posterior wound was somewhat puffy, and a triangular piece of the scapula, easily removeable by the fingers, lay in it. No accident or interruption to the cure occurred till the 14th day, when a most acute pain in the region of the kidneys, and frequent ineffectual calls to make water, attacked him during the night. \* By warm fomentations, and the use of mucilaginous drinks, this accidental symptom was removed. His cure then went on uninterrupted for some days ; granulations of a healthy appearance sprouted rapidly up in all directions ; and the discharge, though copious, was of a very bland nature, and inoffensive in smell, until, in an unguarded moment, he was induced to allow of the removal of the supporting bandage in which his arm had hung since the receipt of the wound. Immediately after this, the pain in the joint and all around became almost insupportable ; the whole upper extremity, and particularly the fingers, became œdematous, numb, and

\* This affection of the kidney, which the older surgeons imagined was a process of nature, to carry off peccant matters, and for which they, therefore, prescribed diuretic vulnerary decoctions, was here, I believe, entirely accidental ; they supposed there was a direct passage from the vena azygos to the kidney.

tormented with an occasional prickly sensation ; and the discharge was very profuse and gleeting, with large drops of an oily nature floating on it, which, both from appearance and from the spot whence they flowed, there was every reason to suppose were synovial. By restoring the arm to its former situation, and applying emollient cataplasms, these symptoms were relieved ; and in a few days, as this increased discharge had very much debilitated him, he was allowed a more nutritive diet, with some English porter. The healing process was soon re-established ; and, by the use of adhesive straps, the edges of this great wound were brought together, and a partial use of the arm was admitted of, with every hope of its regaining its full powers. His general health was completely restored ; and he returned to England in the third month from the accident. In another case, which occurred in the same action, a nine ounce grape shot passed nearly in the same direction, and was cut out beneath the clavicle ; the patient recovered. How the arteries and nerves escaped in these cases, I cannot pretend to explain.

There is a class of wounds in the neighbourhood of the scapula, which, though not of a threatening nature at first, yet often and unexpectedly have a fatal termination. These are principally occasioned by gunshot, but sometimes by punctured wounds, which directly open the infra-scapular vessels, or cause them subsequently to slough and

pour forth their contents internally ; giving to the eye the appearance of very trifling hemorrhage, but filling the whole sub-scapular spaces with blood, which makes its way down to the very loins by infiltration, and causes there deep abscesses and even gangrene. The long and distant range of parts through which the blood passes, prevents the detection of the cause immediately ; and, indeed, could we even discover it, I am not aware of any effectual mode of securing the bleeding vessels. In the cases I have met, the blood has been effused in large quantities, and has descended nearly to the sacrum, dissecting the interstices of the muscles completely, and giving to the posterior part of the thorax and the loins, that appearance said by Valentin to designate sanguineous effusions into the sac of the pleura. \*

The supra-scapular vessels are sometimes the source of fatal hemorrhage when wounded. I have met with one curious case in a French dragoon, who was wounded at the action of Morales by a deep sabre thrust. He was reduced so low by repeated bleedings, that when Staff-surgeon Dease and myself saw him, all hopes were at an end. The wound had been secured by the twisted suture and by compress, which had partially stopped the hemorrhage. On examination after death, the supra-

\* Valentin, "*Recherches critiques sur la Chirurgie Moderne*," Paris, 1772.



scapular artery was found to be punctured, and an aneurismal tumour, as large as an egg, formed at the site of the wound.

In many cases in military practice, when great injury has been done to a man by guns, tumbrils, &c. running over him, the concussion alone is so great, that the functions of the diaphragm, heart, and lungs, are for awhile impaired, and sometimes actual death takes place without any very satisfactory explanation of the cause being afforded by dissection. When the patient has recovered from the immediate shock, inflammatory symptoms often arise to a very high pitch. I have occasionally met with herniary protrusions of the lungs from these causes, which have been attended with no particular inconvenience, but have suppurated freely, and have been punctured like cases of common abscess. But, in general, all injuries of the thorax lay the foundation of a strong disposition to disease, particularly influenced by the state of the atmosphere, and coming very close in their nature to pulmonary consumption. Of this the following are the heads of a case, and the particulars of the dissection, communicated by Mr Reid, assistant-surgeon of the 25th regiment.

#### CASE.

J. G. of the 25th regiment of infantry, received a contusion on the lower part of the left side of the thorax, from the bursting of a shell, at Ciudad

Rodrigo, which produced severe pain, and occasional difficulty of respiration. These immediate consequences were removed by proper remedies ; but in some time afterwards he was seized with a violent catarrh, in consequence of exposure to cold on a coasting voyage. Dyspnœa came on, followed in succession by cough, debility, emaciation, and copious expectoration, until, after the usual vacillation between degenerating and improving health, death in about twelve months terminated his sufferings.

On dissection, the whole of the right lung presented externally the natural appearance, and no adhesions were formed between the pleura pulmonalis and costalis, but two-thirds of its internal substance seemed to consist of small hard tubercles. The left lung adhered throughout its whole extent to the pleura costalis and mediastinum, from both of which it was separated with difficulty ; the lobes also adhered firmly to each other ; the adhesions were very strong, and of a firm dense membranous texture ; the whole lung was of a dark livid hue, and consisted almost entirely of tubercles, which varied in size from that of a grain of common sized shot to the size of a filbert. Three or four of the largest measured one inch in length, by three-fourths of an inch in breadth ; and, when laid open by the scalpel, presented a dark cineritious appearance. They were of a firm, hard, consistence externally ; but, when pressed upon,

or rubbed by the finger, communicated a friable earthy sensation. The whole of the tubercles were uniformly hard and dense, and no tendency to suppuration could be discovered in any of them. Incisions into the substance of the different lobes of both lungs were immediately followed by an oozing of mucus from the bronchia, but no collection of matter, or any mark of recent inflammation, could be discovered. The trachea, particularly the lower part of it, and the larger branches of the bronchia, were literally filled with a glairy tenacious mucus; the capsule of the heart contained about eight ounces of serum, of the natural colour and consistence; the heart was perfectly sound, but remarkably small, and the parietes of the left ventricle were three-fourths of an inch in thickness; the outer side of the left ventricle adhered firmly to the pericardium; the adhesion was of a circular form, and was about one inch and a quarter in diameter; the aorta ascendens was preternaturally hard and dense, but no actual ossification had taken place.

A sense of stricture in the chest, and considerable pain on raising the body to an erect posture, with great anxiety on walking up an ascent, are very frequent consequences of wounds of the thorax after their cure; and, in two cases lately under my charge, great depression of spirits, and a very impaired state of the digestive organs, followed wounds in which the intercostal nervous branches were implicated.

It may be observed generally of the organs contained in the different cavities, that, after any serious wound, their disposition to disease is very much increased, and causes which, in a state of health, would have had scarcely any effect upon them, operate very powerfully. In the head, the tendency to congestion becomes so great, that phrenitis and mania follow any excitement from heat, exertion, violent emotions, and especially excesses in drinking. In the abdomen, hernia, local pains darting around the affected part, irregularity of the bowels and the stomach, borborygmi, gastrodynia, &c. &c. follow its injuries. But the lungs suffer most particularly severely in the thoracic lesions, the slightest atmospheric changes affecting them powerfully. This consequence is almost invariable; yet there have been remarked instances where a naturally delicate, or even an actually diseased state of the lungs, has been bettered by a penetrating wound. An instance of this kind has never come under my notice; although I have very respectable living authority to say, that a strong predisposition to phthisis was suspended in one case, and spasmodic asthma remarkably relieved in another, by penetrating wounds of the thorax. M. Larrey mentions the case of an officer cured of a well characterized phthisis by a wound which penetrated this cavity.\*

\* *Vide* Memoires, Vol. III. p. 376. M. Larrey says, that it occurred to the officer who is represented standing and supported under the arms, in the well known picture of the death of Wolfe.



## INJURIES OF THE HEART.

I SHALL now refer to some curious particulars of wounds and injuries of the heart. Ambrose Paré has, in the 30th chapter of his 15th book, given all the information upon the subject known up to his own day, and proving that they are not instantly mortal. La Motte has given cases in support of the same opinion. Bonetus, in his *Sepulchretum*, book 4th, section 3d, treats on the subject; as does also the illustrious Morgagni, who adds some cases to those collected by Bonetus, in the 53d Epistle, article 27. Haller gives an instance of a needle found in the heart of an ox, in his valuable "*Bibliotheca Chirurgica*," Vol. II. p. 378; and, by the kindness of Mr Hammick, surgeon of the Royal Naval Hospital at Plymouth, I have lately seen a preparation of a pin lodged in the human heart, (but without any trace of the mode by which it got there,) of which some cases are to be found in the References of Ploucquet.—The patient had complained of pain in his chest, about three months previous to his death, and died of carditis. Immense thickening and enlargement of the organ, with extensive effusion of coagulable lymph upon its surface, and adhesion to the pericardium was discovered on dissection. In the last mentioned work are to be found references to cases of balls

lodged in the heart of a stag ; in the heart of a fresh healthy dog ; and in the anterior ventricle of the human heart, where it is stated to have remained for years. The Journals of the day give an instance of a ball lodged in the heart of a deer. But the following is so closely connected with military surgery, that I shall not apologize for offering it in a condensed form. It is furnished by M. Fournier, the learned author of the article “ *Cas Rares*” in the “ *Dictionnaire des Sciences Medicales*,” and quoted by him from an unpublished work on hemorrhage, by Dr Latour, first physician to his Imperial Highness the Grand Duke of Berg. The dissection was performed by M. Maussion, surgeon in chief to the hospital of Orleans.

“ A soldier, who received a gunshot wound of the breast, was taken up for dead, a violent hemorrhage having destroyed all hopes of his surviving. By great care the flow of blood began to diminish about the third day ; his strength insensibly increased ; suppuration came on, and many splinters of bone exfoliated. At the distance of three months the wound was cicatrized, and the patient’s health reestablished, with no other inconvenience than frequent palpitations of the heart, which continued to harass him for three years ; they then became less troublesome for three years more, when he died of a disease unconnected with the affection of the heart. On dissection, the cicatrix

was found to be very deep, with loss of substance of the fractured rib. On further examination, the ball was found lodged in the right ventricle of the heart, near to its apex, enfolded in a great measure in the pericardium, and resting upon the septum medium."

A very curious preparation of a species of herniary protrusion of a pedicle springing from the heart, is to be seen in the Anatomical Collection, founded by the present Director-General of Hospitals, lately at York hospital, but now at Chatham. The following account of it has been furnished me by Mr Blackadder, who prepared it. It occurred in an English soldier who was severely wounded in the chest with a bayonet at the battle of Waterloo. About three months after he was cured and discharged from hospital, he (along with several of his comrades) was attacked with pneumonia, and died under that disease. Upon examination after death, the following morbid appearances were detected : " On the left side of the thorax, two inches below the ensiform cartilage, and immediately under the cicatrix of the wound, there was a lump formed on the edge of the cartilage of the ribs, evidently showing that the weapon had forcibly injured that substance when the wound was inflicted. In the diaphragm, at that part where the pericardium adheres to it, and nearly in a line with the external wound, there was a perforation extending into the cavity of the pericardium, and

of a size readily to admit the ring finger. Through this perforation there protruded a fatty pedicle or tongue of fully an inch in length, and about two-tenths of an inch in breadth; its anterior surface being convex and somewhat lobulated, while its posterior surface was smooth and flat. This pedicle did not adhere to the diaphragm; but, on opening the pericardium, it was found to arise from the anterior surface of the heart, about an inch and a half from its apex. The heart was of a larger size than it is usually met with; and its anterior surface, from a little way above the origin of the pedicle to the base, was attached to the pericardium by means of long, broad, and strong ligamentous bands, which were evidently the effect of an attack of acute inflammation at a period anterior to his last illness. His heart is still preserved, and was one of the first that I put up when employed, in 1816, in making anatomical preparations at York Hospital."

I shall conclude this interesting subject, which I might easily enlarge on, by referring to Guattani "*De Aneurismatibus*," for an instance where a patient survived a wound of the aorta for eight years; and to "*The Medical Records and Researches*," London, 1798, for a case of a penetrating wound, in which a bayonet passed through the colon, stomach, diaphragm, part of the lungs, and the right ventricle of the heart, and the patient survived the accident for upwards of nine hours. It



is communicated by Dr Babington from the records of his Majesty's Royal Hospital of Haslar. Nor should a very interesting and learned paper, by a French army-surgeon, be forgotten. The author, M. Chastenet, surgeon to the Military Hospital at Lisle, in Flanders, has collected various observations on the subject, but he gives five highly interesting cases which occurred in his own hospital. One is particularly detailed from the papers of his father, in which a bayonet had penetrated into the right ventricle. Life seems to have been preserved by the occurrence of faintness, a state in which the wretched sufferer remained without nourishment for five days, concealed under an old staircase. He died the 15th day after the wound, and the 10th after his reception into hospital, where there can be little doubt that his death was accelerated by mortification, which had taken place in his lower extremities, from cold and a languid circulation. On dissection, M. Chastenet found cicatrization completed in both the lungs, pericardium, and heart, and no sign of effusion in the surrounding parts. "Quel triomphe," he naturally exclaims, "pour la Medecine expectante!" This interesting paper is to be found in the *Journal de Medecine Militaire*, Paris, 1782, *et ann. sequent.* edited by M. Dehorne, Vol. II. p. 359. Dr Duncan junior, Professor of Medical Jurisprudence in the University of Edinburgh, has, with great kindness and liberality, permitted me to examine the draw-

ing of a preparation and the history of a case with which he will shortly favour the public, where a ball penetrated the right ventricle near the origin of the pulmonary artery, and where no effusion of blood was found in the pericardium. The patient, a soldier of the Queen's regiment of foot, was wounded in Spain, came to England in a transport, and died at Plymouth on the 16th day after, under the care of Mr Fuge. It must be confessed, however, that all these cases are rather objects of curiosity, and extreme instances of what nature can bear, than cases likely often to occur. Of lesions of the thoracic duct, I shall not insult my readers by treating.

Although every systematic writer has treated upon wounds of the thorax, the French surgeons have been particularly attentive to them from Paré downwards; and, in addition to that great man, Lamotte, Belloste, and Ravaton, as military writers, are well worth consulting, as also several papers in the "*Journal de Medecine Militaire.*" Bordenave and Guerin have given some excellent observations in the *Memoirs of the Academy*; and Valentin in his "*Recherches,*" Guisard in his "*Pratique de Chirurgie,*" Petit in his "*Traité des Maladies Chirurgicales,*" and Sabatier in his "*Medecine Operatoire,*" are highly worthy of attentive study. Among the Germans, Schlichting, in his "*Traumatologia Novantiqua,*" Amstelodami, 1718, gives many instances of both sides of the thorax being opened without the accident proving fatal; and

Schmucker, the great Prussian army-surgeon, has some interesting cases in his "*Wehrnehmungen*;" but Pechlinus, in his "*Observationum Physico-Medicarum libri tres*," published at Kiel in 1682, has given perhaps the most minute diary on record of a wound of the chest, in which the blood lost amounted to an enormous quantity. In this country, Mr John Bell has given an animated and interesting account of these injuries, in his *Discourses on Wounds*; and Dr Halliday, Surgeon to the Forces, has collected and detailed nearly all the experiments and observations of preceding authors, with some cases of his own, in his work on "*Empysema*."

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#### WOUNDS OF THE ABDOMEN, PELVIS, &c.

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THESE injuries are extremely severe in their nature, and very dubious in their results; like other wounds, they divide themselves into those affecting the containing and contained parts. In their treatment the violence of symptoms is to be combated more by general means than by any of the mechanical aids of surgery. The search for extraneous bodies, unless superficially situated, is altogether out of the question, except it can be felt by the probe, as in Ravaton's case, (*Chir. D'Armée*, p. 241,) or in cases of lodgment in the bladder,

where they may become the object of secondary operations. Enlargement or contraction of the original wound as the case may require, for returning the protruded intestine, securing the intestine itself, and promoting the adhesion of the parts, are all that the surgeon has to do in the way of operation; and even in this the less he interferes the better. Nature makes wonderful exertions to relieve every injury inflicted upon her, and they are often surprisingly successful, if not injudiciously interfered with.

In a penetrating wound of the abdomen, whether by gunshot or by a cutting instrument, if no protrusion of intestine takes place, and this, it must be observed, in musket or pistol wounds rarely occurs, the lancet, with its powerful concomitants, abstinence and rest, particularly in the supine posture, are our chief dependence. Great pain and tension, which usually accompany these wounds, must be relieved by leeches if they can be procured, by the topical application of fomentations, and the warm bath, and, if any internal medicine is given as a purgative, it must, for obvious reasons, be of the mildest nature. The removal of the *injesta*, as a source of irritation, is best effected by frequently repeated oleaginous glysters; indeed, on the first infliction of a wound of the abdomen, the contents of the intestinal canal and stomach are generally evacuated spontaneously by vomiting, and soon followed by stools which are sometimes tinged



with blood ; their accumulation must be guarded against by a rigorous diet ; for, to the general state of fulness of the vessels induced by food, is added its local and mechanical stimulus in the undigested form. By this treatment penetrating wounds, in which several plicæ of the intestines have been necessarily implicated, have been happily cured. Authors abound with instances of this kind, and I have seen several ; among others, I have been a witness to the recovery of a soldier who had been shot through the abdomen by a ramrod, which passed in anteriorly, and actually stuck in one of the transverse processes of the vertebræ, from which it was not disengaged without the application of some force ; this occurrence took place before Badajos in 1812 ; it is to be hoped that the gentleman under whose care the case fell will favour the profession with an account of it. Some instances are on record, and among them one remarkable one by Garengot, and another by Lamotte, where a sword had passed right across the cavity of the abdomen without injuring a single fold of the intestines, to which possibly this case may be analogous.

In some instances the ball, or a part of the weapon which has inflicted the wound, remains within the abdominal cavity, and is afterwards evacuated by the natural passages. The subject of the following case I saw while under cure, and I had very lately an opportunity of examining him again and taking the account from his own lips.

## CASE.

PETER MATHEWS, serjeant of the 28th infantry, received a wound from a musket ball in the abdomen, on the evening of the 18th June 1815, at Waterloo. It struck him upon the right side, about one inch below the navel, and three fingers breadth to one side. Scarcely a tinge of blood followed the wound. He did not fall, but walked about 50 yards to the rear; from whence, in half an hour, he was carried to a large barn in the village, where he remained for three days, before he was conveyed to an hospital at Brussels. During this period he was bled three times ad deliquium; the first vein was opened about 24 hours after the receipt of the wound. On his arrival at Brussels, his principal complaint was incessant straining to stool, for which he received daily glysters. On the 6th day from the receipt of the wound, immediately after an enema, he had an urgent call to the close-stool, when he passed a small sized rifle musket ball, enveloped in mucus, and unaltered in shape, except a small groove indented in it, probably from cutting along the bayonet or ramrod of the piece from which it was fired. The wound was perfectly healed by the 26th August following, without any ill accident or uncommon occurrence from the time of receiving it, except, that during the course of the first night, he was sensible of a sort of watery oozing, that moistened the linen placed on his wound, particularly whenever he drank, which

he frequently did. This circumstance he was never after sensible of. He joined his corps at Paris, but had not been more than ten weeks there, when severe pain again arose in the bowels ; some bits of cloth were passed by stool ; an abscess formed externally ; and every symptom threatened approaching peritonitis, which was relieved by active means, under the charge of Staff-surgeon Dease.

In the September of 1816, while attending on the Major-general in command of the south-western district, this man was brought before me for inspection, and I immediately recognised him, having seen him at Brussels, and noted some particulars of his case on the spot. I examined him with Mr Byrre, the surgeon of his corps, and found the abdominal wound perfectly healed, but with a strong herniary disposition. His general health was good, but if he indulged in a full meal, he felt a severe pain in the part. He was subject to obstinate costiveness, and if he allowed the bowels to remain for any length of time in that state, the pain produced in the abdominal region, and particularly in the wounded part, became very severe indeed. The motion of his limbs gave him no pain, although for some time after receiving the wound, he was obliged to bend his body in walking, and he performed that movement with considerable uneasiness ; but if he now stoops, or draws in his breath forcibly, he experiences very severe pain. In all other respects, his general

health and appearance are in as good a state as before the receipt of the injury. \*

Balls very frequently pass clean through the abdomen, evidently wounding the intestines, but without occasioning any protrusion of them at either of the orifices. These cases, like all others of those parts, [are extremely dangerous, but are not necessarily mortal. They require the most guarded attention, and the utmost watchfulness of the approach of inflammation, which comes on often most insidiously, and as often insidiously goes off, but not before the destruction of the patient is effectually sealed. The mildest possible application should be employed to the wounds, and no plugging with tents, or introduction of medicated dressings thought of. Sometimes the effusion of the contents of the intestines takes place very soon after the receipt of a wound ; in other cases, especially of gunshot, it does not appear until the eschars separate. In either case, excessive inflammation is what we have to dread, and the lancet alone is our remedy, used, not at stated intervals, or for measured evacuations, but unhesitatingly employed, whenever pain and tension call

\* Other cases of a similar nature have come to my knowledge, and many are to be met with in Ravaton, Schenckius, Mangetus, and Hildanus, as quoted by Percy ; to which I would add Paré, lib. 25. chap. 19, and Sandifort, who gives three instances in his Thesaurus, Vol. II. p. 120. *Vide* also Sennertus, lib. 5. chap. 5. pars 4.



for it, and continued until the pain is moderated, or the fainting of the patient prevents its further use. The intestine, although not primarily penetrated, yet sometimes sloughs from a wound of the abdominal parietes, and sometimes from the injudicious intrusion of art, particularly the insertion of setons. In all these instances an artificial anus is produced. In fortunate cases, this unseemly alternative is only partial and temporary; in some, however, it continues through life; and most fortunate the patient may consider himself to escape in this way, the establishment of the new passage, being the test of his recovery from the immediate dangers of the wound, and any attempt to prevent it, beyond cleanliness and moderate pressure, during the high inflammatory stage, being extremely reprehensible, and endangering life for the probability of preventing inconvenience.

The following cases are worthy of notice :

#### CASE.

WILLIAM JACKSON, 3d battalion royals, received a severe contusion from a splinter of a shell at the siege of St Sebastians, on the 25th July 1813. It struck him on the right side of the abdomen, at a point nearly central, between the spine of the ilium and the umbilicus. He was put on board ship, to be conveyed to the general hospital at Bilbao, and on the passage the contused part sloughed off, about six days after the injury. On

the first time of going to stool, and for four months afterwards, feces proceeded from this point, but none passed through the regular channel. He was placed under my care in the last week of August. The following is a statement of the appearances then observed : On removing the dressings, which he always did on feeling an inclination to evacuate the feces, a circle of reddish coloured skin appeared, somewhat discoloured with a bilious tinge at its edges, the circumference of which might be about three inches. In the centre was a small puckered protuberance, or papilla, about the size of the point of the little finger. When the feces appeared, their exit was slow and uniform ; the papilla gradually expanding, so as to admit of their passage ; and, during the whole time of their expulsion, a gradual eversion of the coats of the intestine took place, so as to give the appearance of a fleshy ring. On the expulsion being completed, the ring regularly and slowly corrugated itself, and was withdrawn inwards, presenting, on a small scale, precisely the same appearances as the rectum of an horse after dunging. The treatment was of the most simple nature ; cleanliness, moderate pressure by a pad and bandage, of his own contrivance, and a regular diet ; while, to solicit the natural discharge, I recommended the occasional use of a suppository of the common Castile soap. About two months after being received into hospital, he, for the first time,

had a stool by a regular passage, from which period the artificial one began gradually to close; and in about five months, it had contracted to less than a fourth of its original size, being scarcely perceptible, and no feces issuing from it. The general health of this man had not suffered in the smallest degree, which, I think, was to be attributed to the adhesion between the intestine and the abdominal parietes having been completed before the sloughing took place, and the parts became more exposed, and to the very mild and un-irritating treatment that was subsequently adopted. \*

#### CASE.

JAMES MONAGHAN, 40th regiment, was wounded on the 28th July 1813, by a musket ball, which struck him in an oblique direction, and entered exactly over that part of Poupart's ligament of the right side, under which the artery runs. Its internal track cannot of course be ascertained, but it went out at a point of the left or opposite side, nearly corresponding to that at which the sciatic nerve and posterior crural vessels pass. He immediately lost the power of moving the right limb

\* Dr Charles Forbes often saw poor Jackson.—A very instructive case, much resembling this, is given by Vater in the Philosophical Transactions; it took place in a camp follower, wounded at the battle of Ramillies, and continued for fourteen years. Abridgment by Lowthrope, Vol. IV.

totally, while the left was very much benumbed ; and on the first occasion of his going to stool after the receipt of the injury, he passed a very large quantity of clotted blood, mixed with feces, and perceived excrementitious matter and flatus issuing from both orifices made by the ball. This discharge occurred on each occasion of going to stool ; it continued at the posterior orifice for five weeks, at the expiration of which period that wound healed. The feces, however, still continued to be discharged at the groin for six weeks longer ; the posterior wound then broke out afresh, and the feces were discharged from it as before. It then, after a few days, healed, and again opened ; this happened successively for three periods, at each of which fecal matter passed from the wound. During the early part of the cure he had been almost constantly in a state of constipation, and had received daily enemata. He had never suffered any other serious inconvenience, and had not been bled from the arm, but the hemorrhage, on his receiving the wound, he described as very profuse from both orifices, and as reducing him to the greatest imaginable degree of weakness. His treatment under my directions was of the most simple and least irritating nature possible ; by it the posterior wound became firmly cicatrized, and the wound of the groin nearly so ; nothing but a small sinus which had formed on the fore part of the thigh retarding the perfect healing, and this was very



shortly afterwards effected. Whenever this man went to stool, he felt a sensation as if the feces and flatus passed freely along the course of the intestine, until their arrival near the groin, about the sigmoid flexure of the colon, at which period he was obliged to support the hip by pressing upon the site of the posterior wound with the palm of his hand, before he could make an effectual effort towards the expulsion. His general health had never suffered, and he was discharged with no other inconvenience than a slight limp of the right limb, and the necessity above described, whenever he went to stool. How the blood-vessels and great nerves escaped here I cannot pretend to explain; that the latter were closely brushed by the ball, the paralytic affections evidently proved.

#### CASE.

PRIVATE Jonathan Carter, 2d battalion 1st foot-guards, was wounded at Waterloo, on the 18th June 1815, by a musket-ball, which passed obliquely through the long head of the triceps adductor of the left thigh, entered and passed through the lower part of the pelvis below the bladder, wounded the intestinum rectum, and passed out through the inferior portion of the right os ilium, leaving a slight degree of laceration in the gluteus maximus muscle. In order to explain the very extraordinary course of the wound, it may be necessary to state that the patient, when wounded,

was in the act of kneeling on the right knee, in the front rank of his corps, preparatory to their receiving a column of French cavalry, which was advancing in front of them. He was brought into hospital, and had his wounds dressed on the third day after the action. During the first six days after his admission into hospital, his stools were passed involuntarily through the anterior orifice of the wound in the thigh, but no part of them was ever passed by the posterior orifice in the ilium. From this day, (27th June,) they were passed partly by the anterior orifice of the wound, and partly naturally, at the intervals when he was usually called to stool, until the 20th July, when the whole of the fecal discharge took the ordinary course. The posterior orifice had now cicatrized, and the anterior, gradually assuming a more healthy appearance, was ultimately cicatrized on the 20th August following. The only medicine administered to the patient during the whole of the cure was an occasional laxative, according as the state of his bowels required it, in order to render his stools more liquid, and to facilitate their egress through the wound. His general health continued invariably good; and, at the period of his discharge from hospital, he was nearly equal to the performance of his military duty. \*

Injuries of the abdominal parietes from shot

\* Communicated by Mr Reid, Assistant-surgeon, 25th Regiment.

and shell, although they do not penetrate, often leave a great weakness in the part, and a strong disposition to herniary formations, either of the stomach, intestines, or bladder ; hence, a circular belt should always be worn in those cases, and the same precautions used by the patient, as if hernia had actually taken place.

I have hitherto touched upon those wounds only, which require very little mechanical aid from the surgeon. Of this class are by far the greatest proportion that occur in military practice. The older practitioners were very much averse from leaving any thing to nature in cases of abdominal injuries, although their universal employment of sutures ought to have convinced them how much she could bear with impunity ; for there can be very little doubt that their uniform performance of the operation of *Gastrotomy* was at least superfluous, if not positively hurtful. In the course of a very extensive practice, two cases only have come under my notice where it was required to a wounded intestine, though frequently it may be needed for injuries to the parietes. Indeed, the surgical world have long since dismissed their fears about the intestine falling inwards, and about the difficulties of distinguishing between the right and the wrong end of it.

The apprehensions of abdominal effusions are now pretty well subdued. The occurrence is extremely rare, and, when it does happen, we leave

the poor wretch to die in peace without searching after effused fluids, the nature of which cannot be known, or, if known, the information cannot in the most remote degree lead to recovery. I have never witnessed a case where any possible good effects could follow the paracentesis, for peritonitis in its most exquisite form has always preceded the symptoms which would lead to the performance of that operation; I by no means, however, would deny the possibility of the occurrence of effusion, and its relief in this way; for from Vacher, Petit, and other good authorities, we know it has happened; but in the military hospitals, to which I have had access, it has been invariably fatal.

For much of our knowledge on abdominal injuries, we are unquestionably indebted to the valuable observations of Hevin, Petit, and other writers in the *Memoirs of the Royal Academy of Surgery of Paris*, (which it is to be feared have not been referred to with the same freedom that they have been made use of,) to the “*Médecine Opératoire*” of Sabatier, and to the unrivalled Memoir of Scarpa, now rendered familiar by the publication of it by Wishart in an English translation.\* To Mr Travers† we owe a very learned and laborious work on the subject, in which he confirms the experiments of Professor

\* Scarpa on Hernia, Edinb. 1814, Memoir 4th.

† An Inquiry into the process of nature, in repairing injuries of the intestines. London, 1812.



Thomson, which show, first, how nature disposes of the ligatures ; and, secondly, the greater danger of stitching longitudinal than transverse wounds ; and he fully illustrates the process employed by nature in the reparation of intestinal injuries. By his experiments also on brutes, he confirms the observations of Scarpa upon the human subject. Mr Astley Cooper, in his valuable work on Hernia, has greatly increased our knowledge of the pathology of those parts, and illustrated the practice in their injuries ; as has also Mr Lawrence, in his excellent volume upon the same subject. Mr John Bell adds to his Discourse on Wounds of the Belly, a particular illustration of the modes of securing a wounded intestine, and by a plan of the Rahmdorian mode, shows its probable danger ; it may, however, safely be asserted, that this proposal, which originated with the German author, and is detailed by Heister, is in most cases absolutely impracticable.

The great practical point of difference among modern surgeons, in the only operation now acknowledged by them, is the mode in which the suture should be applied. Mr John Bell insists on the interrupted, Mr Travers recommends the continued. The former takes one, two, or more stitches, the latter holds the wounded extremities of the intestine in contact in their entire circumference. Having only practised the mode by a single stitch to the abdominal parietes, and then closing the wound, I can speak of it alone. The

cases were simple ; in one a shoemaker's knife, in another a sabre, had obliquely cut a small portion of the colon of about an inch in length, which had protruded, and on returning it to the cavity of the abdomen, the slit exactly corresponded to the external wound. I cut off both ends of the ligature, as recommended by Mr Benjamin Bell, (although the first step towards that improvement seems to have originated with M. Verdrier, who, in 1731, observing that the ligatures in gastroraphy occasioned a greater flow of matter than all the rest of the wound, cut off one of the threads, \*) a perfect cure was effected in a few days in both cases. Of Mr Travers's mode, which has been found successful by others who have had an opportunity of employing it, I have no personal experience.

If the intestine is strangulated in a small opening, a few cautious touches of the bistoury will be sufficient to ensure their reduction, and if it be not highly inflamed, or evidently disorganized, it may be returned unsecured. Within this short time, a soldier of the 38th regiment, under my inspection, at Gloucester, was gored by a cow ; the intestines protruded, and, although the peritoneal coat

\* *Memoires de l'Academ.* Vol. III. p. 69. See a very interesting case of sewing the intestine, and drawing the ligatures out at the external wound, performed by Mr Peter Travers at Lisbon, in 1757, recorded in the *Philosophical Transactions*, abridged by Hutton, Shaw, and Pearson, Vol. II. p. 73. The patient was perfectly cured on the 35th day.

was lacerated, the bowel was returned, the wound was retained together by straps and simple dressings, and, when I last visited that city, I found the man recovered, under the able care and superintendence of the surgeons of the county hospital. I conceive it to be quite useless to dilate the ends of a divided intestine in order to remove supposed stricture, as practised by some French surgeons, because this apparent stricture is the means which nature employs to produce a reparation of the injury ; the ends of an incised wound being always drawn asunder and everted, with a broad and bulbous lip, from the contraction of the circular fibres behind it, producing relatively to the inverted portion the appearance of a cervix, and the slitting might, in this case, be carried on as long as there remained any intestine to slit. If the opening in the parietes is small, an adhesive strap and bandage is sufficient ; but the openings, particularly by round shot, or shell, are sometimes so enormous, as to admit of the stomach, bowels, or bladder protruding, and to require a very extensive use of the suture, with the assistance of bandage and adhesive straps. The introduction of sindons of linen, and plates of lead, have also been used ; and in those cases, an ingenious French surgeon (M. Desport) has proposed, in the 3d Volume of the *Memoirs of the Academy of Surgery*, a peculiar mode of performing the gastroraphy, by which the thread sufficiently supports the part, and may be loosened at will.

In a very few singularly fortunate cases of this kind, life has been preserved ; but this event does not take place in one case of a thousand, and almost instant death succeeds the injury. The sudden shock, and the withdrawing their usual support from the abdominal contents, seems quite sufficient to produce the fatal event.

I have, however, seen two cases, where the destruction of the patient was not immediately effected. In one, the great arch of the colon was completely laid bare by a round shot, and the patient was reported to me alive within a week after the event ; (indeed, I may here observe, that injuries of the colon are by no means so dangerous as those of other parts of the canal,) the other was a truly melancholy picture of the dreadful effects of the explosion of a shell. An officer of infantry was brought into the hospital of the Jesuits at Brussels in a waggon ; he was laid on a mattress in the room used as an operating-room ; and was in his turn examined by myself and the other surgeons employed on the occasion. Surrounded though we were by the dead and the dying, this case was pre-eminently horrible ; almost the whole anterior part of the abdominal parietes had been blown off, with the exception of the peritoneum, which still remained, though sorely lacerated, and deprived of the muscles ; where the umbilicus had been, there was a large rent through which the omentum protruded, though not to a great extent, and scarcely above the surface, spots of the stomach,



and of the arch of the colon, were visible through smaller rents, and, what was remarkable, no part of the intestines protruded through these openings ; but the most singular circumstance was, that this wretched remnant of life conversed and took some refreshment, for which he repeatedly called during the forty-eight hours that he survived. No opportunity occurred of examining the body after death, although I was very anxious to observe whether nature had made any efforts towards a reparation of the injury, or had been excited to any peculiar action.

The wounds of the fixed viscera of the abdomen, though highly dangerous, are not necessarily mortal ; the simple principle of avoiding or subduing inflammation must guide us in the attempts at relief in those cases. All deep wounds of the Spleen, Liver, or Kidney, are almost immediately fatal from hemorrhage ; some instances, however, occur, where even severe injuries are survived. The slightest reflection on the situation and structure of the Kidney, and on its various sympathies, will at once show the desperate nature of wounds inflicted on it, even with all the caution of a curative intention. In the excellent and learned memoir of M. Hevin on Nephrotomy, this point is most amply discussed and illustrated, and a great mass of evidence is produced on the subject.\* The in-

\* *Recherches Historique et Critiques sur la Nephrotomie ou Taille du Rein, par M. Hevin, Memoires de L'Academie Royale de Chirurgie, Tome III. p. 238, fol. edit.*

stances that I have observed where recovery has been established are very few indeed. If the patient has survived the first hemorrhage, the fever and peritoneal inflammation, with incessant hiccup and vomiting from sympathy of the diaphragm and stomach, have generally cut him off; and if he has for a time escaped, excruciating pains, profuse suppuration from fistulous sores, hectic, and emaciation, have terminated his existence. Where the cure has been effected, there is reason to think that the ureter has been but slightly brushed, and the body of the kidney itself left untouched. The remedies consist in venesection, mild purgatives, as manna, oil, &c., frequent emollient enemas, the warm bath generally, and local fomentations, so as to excite diaphoresis and moderate urinary secretion; with a diet of the mildest kind, but much restricted in fluids, the indulgence in which, even in small quantity, should be avoided. Stimulants under any form, particularly those which can at all influence the urinary organs, as blisters, diuretics, &c. are decidedly hurtful. The dressings should be extremely light, so as to admit of the free percolation of the urine; the neighbouring parts should be varnished over with some unctuous substance, to prevent excoriation, and the bedding should be guarded by an oil skin. By these means a few cases that have come to my knowledge have terminated favourably.

The following case appears to me very valuable. It is perhaps among the most singular on record,

and it illustrates the whole series of symptoms attendant on injuries of these parts. It is told principally in the plain and unadorned language of a soldier, who relates what he felt, without any fixed ideas of the nature or functions of the organs whose lesion he describes. The authenticity of the facts is unquestionable, as, independent of the officer's own history, they have all been corroborated by the testimony of his medical attendants. \*

#### CASE.

“ ON the 9th December 1813,” says this brave man, “ I received a dangerous wound from a musket ball through the body, which entered the right side. The surgeon of the regiment being nearly on the spot at the time I was wounded, had me moved in a blanket to the nearest house, where he instantly examined me, and was about to extract the ball ; but, from the extreme agony in which I was, and from my immediate death being apprehended, he desisted from the operation, and in one return I was actually stated as dead. As nearly as

\* Messrs M'Leod, Hill, and Ryan, Surgeons to the Forces, Mr Dunn, surgeon 23d fusileers, Messrs Thomson and Ekins, assistant-surgeons 38th regiment, and Mr Mayow, surgeon, Winchester. On examination by me in December 1816, in presence of Staff-surgeon Hughes and Dr Knox, at Hilsa, the cicatrix of the wound at the entrance of the ball was found to be close to the interval of the 9th and 10th ribs, about midway between the sternum and vertebræ, and the ball was cut out about the point of the transverse process of the lowermost dorsal vertebra the day after the receipt of the wound.

I can recollect, in one hour after being wounded, the surgeon ordered some tea to be made, and had me moved near a fire. On this movement I expressed a desire to pass urine, which flowed very copiously, and was a second cause of alarm, as it had more the appearance of blood than otherwise. This symptom put an end to all hopes of recovery on my part. On account of the whole army retreating this evening, I was unavoidably moved to the rear, nearly a distance of three leagues, the pain induced by which exceeded description. In less than an hour, while in the waggon, I again passed a quantity of blood, far more visible than before, as it deeply stained every thing that it touched. On my arrival at the quarter destined for me, Assistant-surgeon Ekins bled me, and an enema was administered. I now began, in addition to the pain in my wound, to feel considerable pain from inflammation in the bowels. I soon became delirious, and cannot describe how I was affected for a considerable time ; but I understand I was several times bled to keep back the inflammation. I recollect that, on my reason returning, I sent for a surgeon to examine my *right shoulder*, as I could not be persuaded, from the pain I felt, but that I was wounded there also. This was not the case. For fourteen days I understood no other nourishment was given me but small draughts of tea. I recollect that large blisters were applied to my belly and breast, and that I drank several



draughts, and took several pills, to compose me. The wound in my back nearly mortified by my lying so long. I thought I should never recover the use of my arm, and I could not stretch out my legs, particularly the right one. I also suffered great pain between the wounds, and do so to this day, and I must be very cautious in raising my body suddenly. In about seven weeks I was removed farther to the rear and sent to England."

This gentleman arrived in England, and, after passing some time in London, proceeded to the dépôt of his corps. In consequence of the journey fever was excited, which proceeded to a considerable length, and peritoneal inflammation again attacked him. On the second day after this attack, a tumour formed in the site of the posterior wound, which in about a fortnight was punctured, and discharged nearly six ounces of purulent matter, of an urinous smell. The discharge continued for some time, and another abscess formed lower down, which was punctured in about three weeks, and a large quantity of pus of the same kind was discharged from it. The discharge varied in quality from time to time, and the abscess occasionally healed and burst open again. In the meantime, the pain and emaciation were very great; and the quantity of urine diminished, with very frequent calls to pass it. In this way he continued, with little variation, and with small hopes of recovery, until the end of July. I shall now resume the

narrative in his own words. “ I lingered in this state, constantly using medicine to enable me to pass urine, as it was supposed I had the gravel. The passage of the urine became every day more difficult, and I found that the extreme pain I felt moved first from my side to my belly, and gradually on to the testicles, and latterly to the penis. The flowing of the matter continued great, and very much savoured of urine ; my skin was at times exceedingly fair, and at others completely yellow ; and my eyes glistening, and the white at all times discoloured. I at last became so exceedingly uneasy from the frequent attempts to pass urine, (which every day diminished in quantity so greatly that I could not at length evacuate more than by drops,) that I was reduced to a state of frenzy, when, about twelve hours before the following extraordinary event took place, the discharge from my wounds, which had been lessening for two days before, suddenly stopped ; the pain and the pressure of urine became so great, that I could no longer exist ; all my efforts were vain,—nothing but drops would pass. While in this state of agony, the surgeon was sent for. Before he arrived my desire increased, when another attempt was made, but with less effect than before. I remained in the greatest torture for more than three minutes, when a burst of urine took place, and with it a *lump*, which struck forcibly against the chamber-pot ; the most uncommon quantity of urine followed, coloured

with blood ; and in less than an hour another discharge, having less colour of blood than the former. On the arrival of the surgeon the chamber-pot was examined, when *a lump, in the shape of a short thick shrimp*, was taken out, which was that night thought a stone, being covered with black grit, and very hard. One side was lighter in colour than the other, where I suppose it was fastened to. It was placed in a glass, and in the morning all the surgeons examined it, by which time it became dry, and, on being pressed, it clearly appeared to be *cloth*, which had been driven in by the force of the ball. I do believe, that the great pain that I felt in the side, and, as it made its approaches, was solely occasioned by its movements ; and also, that it remained some time near the bottom of the testicles and penis. I do not hesitate to say, that it has injured the parts of the passage, from symptoms I now feel.”

This officer is now in good health. He keeps the cloth as a relic. It is three quarters of an inch long, and tapering to a point like a piece of the end of a bougie. Two projecting shreds, like antennæ, now gone, but which originally belonged to it, gave it the appearance of the shrimp which he describes.

The passage of the cloth from the wound in the breast, across the body, through the ureter into the bladder, and thence by the urethra, can admit of no question ; the dilatibility of the ureter,

and urethra, is sufficiently great to admit of the passage of much larger substances, formed within the body, or casually introduced.

The cases on record of recoveries after wounds of the kidney are not numerous. The excellent Haller gives us one in his *Opuscul. Patholog. Obs.* 69 ; and Bourienne furnishes another in the *Journal de Medecine*, Tome XLII. p. 554. They are treated of by almost all the systematic writers. A special dissertation on them was published by Gittler at Leipsic, so far back as 1596, the only monograph, with the existence of which I am acquainted.

Extraneous bodies, particularly balls, are frequently carried into the bladder itself, either as it rises above the pubes, or through the openings in the pelvis ; or work their way into it, and either come off by the natural passage, or are removed by a surgical operation, conducted on the same principle as that of lithotomy. Wounds in this part are dangerous, in proportion as it is full of urine at the time of their receipt, or as the upper and anterior, or lower and posterior part of the viscus may be wounded. If the intestines are implicated in the wound, it is highly dangerous. Inflammation from wounds of these parts runs rapidly into gangrene, from the delicate nature of the organs wounded, and the increased irritation proceeding from the effusion of the urine, and its filtration through the cellular substance, which completely destroys all its natural connections. If there is a free extensive pas-



sage, much of this danger will be obviated ; and after the first effusion from the bladder has taken place, the judicious use of the elastic gum catheter affords us an admirable assistance against this accident ; indeed, without this useful instrument, our practice in wounds of this nature, and in those affecting the urethra, would be merely confined to looking on and moderating symptoms, instead of preventing them, as we are now enabled to do. With the aid of the catheter, I have seldom met with any cases of wounds of the bladder and urethra, which required more than an antiphlogistic regimen, an open state of bowels, mild dressings, and cleanliness ; to which, if the edges of the sore have become irritable, a mild solution of the nitrate of silver, applied with a camel's hair pencil, has been added. I have very rarely had occasion to use the knife for the enlargement of the wound or to pare its edges, when I have treated the case from the beginning, or where the catheter and proper dressings have been employed. A perfect cure is the general result in sound healthy constitutions ; but, in habits of a different kind, and more especially if they have been hard drinkers, the reverse is the case, and the most distressing symptoms, as repeated sloughings, foul and deep ulcerations, or fistulous sores, remain.—I presume it is superfluous to speak of the stitching this organ, as a means of remedying its injuries.

If extraneous matters carried into the bladder

are of a soft yielding nature, or of a small size, the natural flow of the urine often carries them out. Of this the following are examples :

#### CASE.

JAMES ROWAN, of the 50th regiment, aged 44, a man of a very robust constitution, was skirmishing in front of his corps in the Pyrenees, on the 25th July 1813, when he received a musket ball, which, passing through the skirt of his regimental jacket, entered a little above the tuberosity of the left ischium, in a direction towards the sacrum, and lodged, as was supposed at the time, in the neighbourhood of that bone. The swelling of the soft parts was so considerable, and the general inflammatory symptoms ran so high, that when he was carried to the field hospital, it was deemed improper to probe much after the ball. He was, therefore, freely bled ; his bowels were well opened ; and emollient applications being applied to the wound, he was sent down to the general hospital, at the convent of St Domingo, Vittoria.

On the subsidence of the inflammatory symptoms, several attempts were made in search of the ball, but with no other effect than to convince the assistant, under whose charge he was more immediately placed, that it did not occupy the situation originally imagined, but had passed onwards directly into the pelvis.

The patient's general health did not suffer ;

the wound was scarcely more troublesome than a common flesh wound, and was unattended with any peculiarity in the appearance, or in the character of the discharge ; in short, he was so far recovered in the course of three weeks, that he was sent down to the general hospital at Bilbao in a covered waggon, along with a numerous escort of wounded, a distance of nineteen leagues. On his arrival, he complained of being a good deal shaken, but the wound was nearly healed, and, on the most minute examination, no trace of any extraneous substance could be discovered in it. There was every reason, however, to suppose that the bullet was lodged in the neighbourhood of the bladder, for he complained of a dull sensation in the glans penis, and numbness and coldness of the testicles, attended with great pain in making water, and occasionally an inability to retain it ; there was, nevertheless, neither stoppage nor tortuosity of the urinary stream.

The wound was perfectly healed in the first week of December, or about 130 days from its infliction, when he was discharged to the convalescent depôt, where he remained for six days, when the uneasy sensations of the urinary organs arose to actual pain, which he attributed to his change of bed, and not living so comfortably as he did in the hospital. For this grievance he had recourse to a soldier's remedy, and drank as copiously of country wine as his finances would allow. After

having committed a debauch on the evening of the 8th day from his quitting the hospital, he was seized with an irresistible desire to make water; and, after some severe straining, in which he was sensible of an obstruction about the neck of the bladder, which for fully half an hour prevented the passage of a single drop of urine, he shot out of the urethra with a convulsive jerk, a substance coiled up, somewhat in the shape of a fragment of a large bougie, nine lines in length, and three in breadth, the ejection of which was followed by a profuse flow of urine, passed without any muscular exertion, and succeeded by instantaneous relief. On examination of the ejected substance, it proved to be two bits of cloth, consisting of his jacket and its lining, corresponding with the size of the shot-hole. The texture was unaltered, but the colour of the red piece was much faded; it had neither any urinous smell, nor was any calculous concretion observable on it.

I had an opportunity of examining this man in February 1814; the wound was perfectly cicatrized, and no disorder of the urinary organs was present; but not the slightest trace of the ball could be discovered, either by the sound, or the finger introduced into the anus. \*

\* This case has been published in the 5th Volume of the London Medical Repository, p. 283. The cloth is in possession of my friend, Mr Thomson, one of the editors of that work.



## CASE.

T. D. aged 39, a soldier of a light infantry corps, was wounded by a musket-ball on the evening of the 18th June. It entered the pelvis at about one inch and quarter from the symphysis of the pubes, grazing close to the bone, and came out, unaltered in shape, through the buttock of the same side, about three inches from the sacrum. In this course the bladder, which was much distended with urine, was injured ; great stupor and pain of the part was experienced on the receipt of the wound, and it particularly affected the loins, and testicle of the wounded side. He had a strong inclination to void his urine immediately after the receipt of the wound, and on doing so it passed entirely through the anterior opening over the pubes, and not a drop by the natural channel ; the efforts to pass it were attended with severe pain. When my attention was particularly called to him, in about four weeks after his wound, I found that the urine still passed, but in small quantities, from the upper orifice ; the posterior one had closed, and the other was inclined to heal. The urine had been almost constantly carried off by means of an elastic gum-catheter, but notwithstanding, an abscess by infiltration had formed on the inside of the right thigh ; from this abscess, some small pieces of bone, to the amount of about twenty grains in weight, and the largest of

about the size of a grain of coarse gunpowder, had passed at different times. The urine drawn off from the bladder was in general turbid, and on being allowed to deposit its sediment, about three drachms of osseous grit had been collected from it at different periods. After some time he began to pass the urine partially by the natural passage, and the same osseous grit was deposited, while a discharge of more palpable bony particles appeared in the stream; these were collected from time to time, and amounted to three drachms in weight; the largest piece was circular, flat like a piece of coin, and of the size of a split pea. The man was transferred from my care and sent home to England. I saw him eight months after; his general health was good, but the osseous discharge still continued. He presented me with some few pieces of the bone, rough and angular, about one-third of an inch in length, and one-fourth broad, which had all passed by the urethra, and weighed together about an additional drachm; and also one piece which had passed by the wound, of about the same size as the others, but smooth on one surface, evidently an exfoliation direct from the pubes, without having been acted on by the urine.

Air is sometimes, but very rarely, passed from the bladder, most probably from some opening in the ureter communicating with an external wound; or, as in the cases mentioned by \* Camper, from

\* *Demonstrat. Anatom. patholog.* Lib. ii. p. 16.

ulcerations connected with the intestines. I saw a case of this kind at Brussels, and Dr Theodore Gordon, physician to the forces, has most obligingly favoured me with the following notes of it.

#### CASE.

AUGUSTUS LABICHE, 7th French dragoons, was wounded June 18th 1815, by a musket-ball, which entered the left hypochondrium, directly under the 12th rib, near its anterior extremity, and came out to the left of the 2d vertebra of the loins, close to the spinous process. Some blood passed through the urinary passage the first few days after receiving the wound. Up to the 13th July, the discharge through the wound on the back was very copious, and mixed with thin feces, and with the seeds of fruit which he had swallowed; the wound under the rib discharged very little. On the 14th of July, he, for the first time, had a sensation as of air passing through the urethra, with a gurgling noise after discharging the urine. On the 16th, the wound on the back was healing up, and the feces ceased to pass. On the 20th, the bed-clothes and bandages betrayed a strong urinous smell, and urine was observed to pass from the posterior wound; the noise formerly heard on making it, now ceased, but on passing it with the penis immersed in water, about a cubic inch of air bubbles made their appearance. The passage of air bubbles from the urethra, and of

urine from the wound in the back had ceased entirely about the 8th of August, (or the 51st day from the receipt of the injury,) and the wounds in both the side and back were considerably diminished. In a few days after this he complained that he wanted to pass wind ; he felt an acute pain in the wound, as if the air had first proceeded there, and then had passed off *per anum*. The pain continued to increase, and the wound to assume a fistulous disposition, till, on the 57th day, the air again began to pass both from the wound and the urethra, and a slight gonorrhœa appeared. He soon after began to recover fast. The change of the medical officers, who were removed to other duties, and the restoration of the prisoners to their native country, prevented the continuation of the notes of the case ; but the impression on Dr Gordon's mind is, that the man finally recovered. The external treatment of his wounds was confined to simple dressings.

Where a ball has struck the region of the bladder, if its force is weakened by distance, or broke by encountering the elastic integuments and the coats of that organ, and still further resisted by the presence of a quantity of urine, it sinks down through the fluid, and often remains unnoticed amid the other circumstances of the wound, until it gives rise to a train of symptoms, which ultimately call for the incision of the bladder. This operation, which has been not unfrequently re-



sorted to, has lately been successfully performed at the York Hospital, Chelsea, by Mr Guthrie. A similar operation was performed at St George's Hospital on a soldier, who was shot in the bladder at the siege of Lisle, and operated on the spring following; a view of the calculous concretion is given by Cheselden, in his book on the High Operation, London, 1723, Plate X. Garenggeot, in his *Traité des Operations*, Vol. I. p. 17, gives a case of an officer cut for a stone, the nucleus of which was a musket-ball, which remained in his bladder ten years; and Hildanus gives a case where a ball remained for thirty years in the bladder, Cent. 3, Obs. 67.

Wherever it is probable that a ball, cloth, or large portion of bone is lodged in the bladder, it unquestionably becomes our duty to extract it at once by the original wound, if possible, without the more formal operation of cystotomy. It has been said that balls have been passed by the urethra, \* but no prudent surgeon would trust to such an event. An ingenious idea of dissolving the ball by means of crude quicksilver, was started in France; Le Dran instituted some experiments on the subject, he effected the amalgamation of lead in a vessel filled with urine, and brought to the heat of the body; he went a step farther, and, thrusting some lead into the bladder of an ass, conceived that it

\* Paulinus, Cent. 3. Obs. 49. Ephemerid. Nat. Cur. Dec. 2, 3.

had been there dissolved by quicksilver ; he then operated upon a West Indian Governor by the mercurial injection, for the removal of a piece of a leaden bougie, which had broke short in his bladder. All France rung with this new and ingenious operation, and the contriver was so far deceived as to affirm that the lead was discharged ; but on the Governor's death, which occurred some time after, the identical piece of lead was found in his bladder.\* The use of mercury has also been at times adopted for the removal of leaden balls from other parts, but without success ; in some cases, it has insinuated itself among the cancelli of the bones, the fibres of the muscles, and the tendinous sheaths, and produced great irritation.

Depositions of calcareous matter are often formed in the bladder after its coats have been injured by a wound. In a case lately operated upon by Staff-surgeon Dease, it was nearly filled with loosely compacted urinary depositions, part without any visible nucleus, some masses with splinters of bone for their nuclei, and, in several points, the calcareous crust adhering to the internal coat of the bladder itself. The patient was wounded in the anterior part of the viscus, and suffered most severe torture during the protraction of his life for three years. Circumstances forbad the examination of the body after death.

\* Vide Percy, page 137.

Paralysis of this organ is also a common effect from blows of shells, &c. and an actual diminution of its cavity occasionally takes place, by its thickening and adhesion to the pubes and other adjoining parts ; rupture also sometimes occurs without any external solution of continuity. Time and moderate external stimuli are useful in the first case ; the antiphlogistic regimen, in all injuries, will go far to prevent the second ; but the last is an occurrence uniformly fatal.

In addition to the observations upon the wounds of the bladder by the systematic writers, the military surgeon will derive much information from Garengeot, and from Desportes, in the “ Operations de Chirurgie” of the former, and the “ Traité des Playes d’armes à feu” of the latter. Bordenave, in the *Memoirs of the Academy*, 2d Vol. p. 521, and Bourienne, in the “ *Journal de Medecine*,” Tome XXIX. are also well worth consulting. But the most instructive cases, that, I believe, are to be met with, will be found in the “ *Mémoires*” of Mr Larrey. No special treatise exists, to my knowledge, upon the wounds of the bladder ; these wounds, it may be observed, are less dangerous in the full than the empty state of the organ, as there is less risk of an injury of the intestines being superadded.

A deep wound of the Liver is as fatal as if the heart itself was engaged ; the slighter injuries are recoverable, particularly if the membrane alone is injured. The site of the wound at once points

out the organ affected, and the suppression of some of its functions almost invariably succeed.

The usual symptoms which characterize these injuries are yellowness of the skin and urine, derangement of the stomach, and of the alimentary canal, and cutaneous affections, particularly great and distressing itching. The discharge from the wound is generally yellow and glutinous, but I have seen it of a serous nature, and sometimes very nearly allied to unmixed bile. The following case will exhibit the symptoms, and the mode of treatment adopted, in a very dangerous and complicated case.

#### CASE.

JUNE 18th 1815.—Lieut.-Col. H. received a musket shot, which, entering between, and partially fracturing, the 8th and 9th ribs posteriorly, at about two and a half inches distant from the spine, passed out between the 7th and 8th anteriorly, about four and a half inches from the sternum. The hemorrhage, which continued for three days from both wounds, was so excessive, that he could not be moved from the neighbourhood of the field of battle. The 11th day he was brought into Brussels, when I saw him, with Deputy Inspector Gunning, Surgeon in chief, and Mr Robinson, surgeon of the 16th dragoons. His pulse was then about 90, and hard; his countenance pale, and sunk; his eyes glazed, and with



difficulty kept open ; his skin of a dusky yellow, and bedewed with a clammy sweat ; the tongue foul ; the respiration difficult, and interrupted by frequent singultus. He had great sense of weight and pain in the region of the liver, but his severest complaint was an inability to remain in one posture, and want of sleep. He had occasional but not violent cough, and expectorated some coagula of blood. On examining the posterior wound, I found a copious glairy yellowish discharge, mixed with air bubbles, and some small streaks of blood ; the anterior wound was nearly closed. The treatment which had been adopted by Mr Robinson had been so judicious, that no alteration was proposed ; he had bled his patient five different times copiously, and had kept his bowels regular daily with solution of neutral salts, and *ol. ricini*. The inflammatory symptoms returned on the night of his arrival, from which time, till the morning visit at six o'clock, he lost 30 ounces of buffy blood at three bleedings. The following are the reports of the case during its progress under my inspection.

12th day.—Extremely low and weak, so as to be scarce able to answer questions ; pulse 80, weak and fluttering ; he tosses incessantly in the bed, and speaks very incoherently ; discharge very copious, thick, and of a deep bilious tinge ; belly hard, and bowels costive ; cough severe, and he spits up a tenacious yellow mucus, of bitter taste, and offensive smell, but with great difficulty, and

in very small proportions. He was ordered an emollient glyster, and to drink of a solution of gum arabic, sweetened with capillaire. 13th day.—Last night all the symptoms became aggravated, so that the assistant-surgeon, Mr Bingham, who sat up with him, took 12 ounces of blood away, which immediately relieved him. On examination of the wound this morning, the edges of it, for about an inch round, were emphysematous, and the discharge of a still deeper yellow colour, and more tenacious consistence than before. Up to the 24th day of July, or 37th of the wound, very little hopes of his recovery were entertained; the bilious discharge from the posterior wound continued copious, and the bilious expectoration the same. On pressing the edges of the posterior wound, the air could be forced out, so as to raise the glairy bilious discharge into a large-sized bubble, but there was no distinct rush during respiration; the anterior wound was nearly closed; he complained of a griping pain in his bowels, and of a great sense of fulness, notwithstanding that he had some doses of castor oil, and his nightly enema had procured him several regular stools; his tongue also was foul, and his hiccup, which had left him for ten days, now returned. His castor oil was repeated. 38th day.—His eye had very much recovered its natural lustre; his tongue was clean, and he slept some hours quietly. Since the administration of the purgative and injections, he has had 12

stools, with each of which he has passed hardened scybala, mixed with dark bile, and a quantity of matter of the consistence of paste, like moistened pipe-clay. Hiccup and bilious expectoration gone. Asked for an increase of food, which, up to this day, has been either fruit, (strawberries,) or some very light gelatinous matter. 40th day.—During the night he was seized with a violent and universal itching over his whole body, but more particularly over the legs and thighs; the skin, however, is free from any eruptive appearance, and is nearly of a natural hue and feel. He was now ordered a nightly warm-bath. 41st day.—The discharge from the wound very remarkably changed in quantity and appearance; the quantity was not the fourth part of what it had been, and had lost its bilious hue. Had one very copious bilious stool, being the first without medicine which he has had since his wound; itching still continued unabated. From this day he gradually improved. By the advice of Professor Thomson, he took an occasional squill pill, and every third night about six grains of the pil. hydr. A few spiculæ of bone came away from the posterior wound, but without any pain or annoyance; and on 1st September he had recovered almost perfect health.

The complication was still greater in the following successful case, communicated by Mr Hughes:

## CASE.

JOAC. CORDEIRO, private in the 8th regiment of Portuguese infantry of the line, æt. 20, was wounded, when carrying a ladder, at the unsuccessful attempt to storm the forts at Salamanca, June 1812. A large ragged shot hole appeared in the centre of his left cheek, passing obliquely inwards and downwards between both jaws, and fracturing the two first molares of the under jaw ; its course was followed by the finger to about an inch and half before the angle of the jaw, on the inside of the bone, and from this a considerable clot of blood was removed, but no farther trace of it could be here perceived. His breathing was quick, and laborious ; his pulse frequent and small, and his countenance ghastly. He said he had coughed, and vomited some blood, but his chief complaints were acute pain in the opposite shoulder, tightness in the chest, and frequent inclination to go to stool ; his evacuations consisted of dark coloured blood, and greenish mucus in small quantity, and were attended with tenesmus. On examining with my fingers on the outside of the neck, (no line or blush on the skin appearing to guide me in tracing the ball,) a crackling feel was observed about one-fourth of an inch below the bone, close to the inner edge of the mastoid muscle, which was traced in the direction of that edge as far as the sternum, and here it was lost. I be-



gan to fear the lodgment of the wounding body in the chest ; but, continuing to examine carefully all about the confines of the thorax for further guidance, I had the fortune to come on a line of similar feel to that in the neck, which commenced about an inch below and to the right side of the umbilicus, and led my fingers to the posterior part of the right hypochondrium ; here it stopped on a hard round substance, which I had no doubt was the ball ; the tumefaction over it was scarcely perceptible ; but on fixing the hard body, and cutting on it to the depth of about half an inch, I extracted without difficulty a four ounce grape shot ; it was followed by a small quantity of dark grumous blood, and I proceeded to take from his arm 18 ounces more, which produced syncope. I directed an emollient enema to be administered, and the abdomen to be fomented ; a large quantity of greenish fluid mixed with clotted blood followed the enema ; his pulse rose, and became more firm and equable about an hour after the bleeding, when I found him in a disturbed sleep. At noon his pulse was about 112, strong and hard, pain in the right shoulder severe, breathing difficult, and constant inclination to go to stool, with distressing thirst and headach ; evacuations bloody. In the act of taking his arm to repeat the bleeding, he lost about two ounces of dark coloured blood from the exit of the ball, twenty ounces of blood were abstracted from his arm, and the enema

repeated, which brought off some clots, with a little green-coloured feculent matter. The fomentation was continued, and a dose of eastor oil administered, which, before evening, procured three easy, copious, feculent motions, the last of which was a little tinged with blood. At the evening visit his pulse was 87, soft and regular; he was free from pain, breathed easily, and complained only of thirst. A slight return of pain in the shoulder, and soreness over the hypochondrium, obliged me the following morning to take away 12 ounces of blood, and from this time he went on invariably well, and commenced the campaign of 1813 in good health. In this case the ball appears to have passed along the inner surface of the chest without injuring the lungs, and to have entered the abdomen, where it injured a portion of the intestine and implicated part of the liver. \*

I have never known a patient recover after a wound of the Gall-Bladder, and, indeed, it is difficult to imagine a case where it could happen without an effusion of bile into the abdominal cavity, except a previous adhesion had taken place to the parietes; a case, however, is mentioned in the “*Opuscules de Chirurgie*” of Paroisse, p. 255, where a leaden

\* Loesecke, in his *Observationes Anatomic. Chirurg. Med.* Berlin, 1754, p. 7, gives a very remarkable case of a complicated wound, in which a screw exploded from a musket, penetrated the ribs, lungs, diaphragm and abdomen, without destroying the patient.

ball had lodged for the space of two years. A case I believe unique is reported by Dr Thomson at page 99 of his Report, where nature had provided against the extravasation of bile from the substance of the liver into the cavity of the abdomen, by the means of newly formed adhesions of considerable extent. Waton, a French army surgeon, gives a fatal case from the puncture of the cyst by a bayonet, in the *Journal de Medecine Militaire*, Vol. VII. p. 550, and Sabatier gives another in his *Medecine Operatoire*, Vol. I. p. 34. The observations upon wounds of the liver itself are very frequent in authors. Morgagni in his 53d Epistle, article 40, gives a very interesting case; and some valuable observations will be found in the works of Desault and Chopart. There are very few of the collectors that do not abound in instances, both fatal and otherwise, and some special dissertations are to be found on the subject, particularly one by Kaltschmidt in Haller's Collection, Vol. V. and one by De Bergen, published at Frankfort, 1753, and to be seen also in Schlegel's Collection, Vol. V.

Of the wounds of the Diaphragm, I have never met one unconnected with injuries of one or both the cavities which it divides, or in which symptoms of their being affected did not appear; although I have met with one instance where a musket ball passed along from the sternal to the vertebral connection of that septum, precisely fol-

lowing the curvature of the ribs ; nor have I, in those cases which have come within my view, ever observed that peculiar spasm, (*risus Sardonius*,) described by the older authors, and lately noticed by M. Percy. The prevention of inflammation is the leading indication of cure ; but injuries are frequently found on dissection, which were not at all indicated during life by any peculiar symptoms. Sometimes the diaphragm is injured in two different points by the same ball ; an interesting illustration of this has been furnished me by my friend Dr Thomson. A lad received a wound from a musket ball, which entered the left side between the 10th and 11th ribs posteriorly, and passed out nearly in a direct line beneath the 8th, at the distance of five inches from the sternum ; he died on the 5th day. On dissection, a considerable quantity of air escaped from the left cavity of the thorax ; it contained about three pounds of bloody serum ; the lungs on that side were completely collapsed, though, on inflating them, they did not appear to be wounded ; the surface of the lungs, pleura, and upper part of the diaphragm, were covered with coagulable lymph, which adhered very loosely ; the ball broke the 11th rib, and drove some splinters of it into the diaphragm, entered the thorax, passed through the septum into the abdomen, grazed the upper surface of the spleen, which was covered with coagulated blood, returned again through the diaphragm into the cavity



of the thorax, and passed out below the 8th rib, none of the other viscera appeared to be wounded. Paré gives us two cases in his 10th book, where the colon passed through an opening of the diaphragm made by a ball, and another, where the stomach passed through one made by a sword. I have already mentioned a case where a hernia of the stomach was found through a hole in the diaphragm, supposed to have been made by a musket ball. M. Ravier, in the *Journal de Med. Militaire*, Vol. I. p. 114, gives a case where the principal viscera of the abdomen passed into the thorax, after the receipt of a violent blow on the belly; and Mr Boyle, surgeon of the 62d regiment, gives a case of hernia of the stomach through a wound in the diaphragm, in the *Ed. Med. Jour.* Vol. VIII. p. 42. Morgagni, valuable on every subject, is highly so on the injuries of the diaphragm, in his 53d and 54th Epistle; but the most interesting account that I am acquainted with, is given in the article "Diaphragme," in the "*Dictionnaire des Sciences Medicales*," by M. Percy.

Of wounds of the Stomach, I have never treated an instance, nor did I see the two reported by Dr Thomson, which occurred at the battle of Waterloo, one from a musket ball, the other from a pike. They were treated on the mild unirritating plan adopted for wounds of the intestines, and I understand both did well. The histories of the Bohemian, Prussian, and English "Cultrivores,"

in some of whom the knives have been cut out, and in others discharged spontaneously through the coats of the stomach and parietes of the abdomen, as well as many other instances on record, are very encouraging in cases of injuries of this organ. Mr Hevin, in his excellent paper, in the 1st vol. of the *Memoirs of the Academy of Surgery*, page 144, has collected a number of interesting instances of recovery, both from incised and gunshot wounds. But the industrious Plouquet, in the articles “*Ventriculus*” and “*Pantophagi*,” has exceeded all other authors for the vast number of cases he has amassed. In our own *Philosophical Transactions*, Lowthorpe’s *Abridgment*, Vol. VI. p. 192, or in the modern one by Drs Hutton, Shaw, and Pearson, Vol. IV. p. 66, an instance is given where the stomach of a horse was wounded and sewed up, and a similar instance in the human species ; both recovered. More recently, sutures have been applied to its wounds in Holland and France, as may be seen in the “*Annales de Litterature*,” &c. by Kluyskens, Vol. II., and in the “*Traumatologia*” of Schlichting ;” and I understand that it has been again successfully done, very lately, on the Continent, by the French army surgeons. Not unfrequently, a wound of the stomach has become fistulous, and remained open. Richerand gives a very curious case of this kind, where the opening remained for nine years ; Etmuller, in the 5th vol. of *Hal-*

ler's "Dissertationes Chirurgicae," gives an instance where it remained open for 10 years ; and Wenker, in the same volume, relates a case where a wound of the stomach continued open for the long space of 27 years.

Of wounds of the Spleen I have seen a few ; some of the slighter recovered, the deep invariably proved fatal. Experiments on the brute creation have given rise to some speculations on these wounds ; but without incurring the charge of hardened scepticism, we may be permitted to doubt if the result of injuries, whether accidental or deliberate, on the lower animals, can be held as perfect illustrations of similar inflictions on the human body, although there may exist a very strong coincidence. Dionis, a very sagacious French author, whose work is well known in this country, has made a very striking observation on this point, as applicable to the spleen. "About thirty years ago," says he, "a certain sect of surgeons sprung up, who took great credit to themselves for performing the extirpation of the spleen ; they looked upon this part as useless, and even hurtful, perhaps because they did not know its functions. They supported their theory by an analogous operation on dogs, and *because the animals did not die upon the spot*, they extolled the advantages it would be of to the human species ; but all the animals subjected to it died shortly after, and no human being was found to submit to the proposal." It would ap-

pear, however, from Haller and others, that the brutes in many instances became more fat and salacious; and there is a recent instance on record, in which it has been successfully removed from man by Mr O'Brien, a naval surgeon, (*Medico-Chirurgical Journal*, 1816, Vol. I.) where it had protruded at an incised wound. This is certainly a more favourable case than if it had been injured "*in situ*," where the blood from its numerous vessels might have been extravasated into the abdominal cavity,—a circumstance which seems to be the principal cause of the danger of its injuries. In some cases of wounds of the fixed viscera of the abdomen, particularly the spleen and liver, a critical hemorrhage from the wound, or a spontaneous diarrhœa, have relieved all the urgent symptoms, after copious purging and venesection had been employed before without effect.

Some interesting observations of wounds of the spleen are to be met with in Richter's *Bibliotheca*, B. 8. p. 533, and among the older authors, as in Fallopius de *Vulneribus*, Chap. 87, and in Schenckius, Lib. 3, Obs. 104. A special dissertation on them, by Pohl, is extant in Schlegel's *Collection*, Vol. II.

From severe blows or bruises upon the abdomen, very serious injuries are inflicted without the solution of external continuity, and even instant death is no unfrequent consequence. Dissection in some instances explains those cases, but in



others we are left entirely in the dark, and until we can affix a more appropriate name, we may apply the term concussion to them, as we do to the unknown cause of death in injuries of the head. Nor is the analogy so loose as might at first sight be supposed ; for, independent of the lesion of the organs contained in the two lower cavities, the spinal marrow may be affected in a way beyond the reach of our senses to discover. Some cases of the effect of pressure upon it from internal causes, and some of the experiments of Gallois in France, and Philip and Clift in England, \* open a wide and interesting field for inquiry, which the difficulties attendant on examining the *Theca Vertebralis* ought not to deter us from pursuing. Where the powers of life, therefore, are obviously sinking, stimulants, both general and local, as wine, æther, warm friction, blisters, &c., may be used, followed up, if active inflammation should show itself, by the depleting plan.

It is from the neighbourhood of the spinal marrow, and the great nerves proceeding from it, that all wounds of the bony pyramid derive their greatest interest ; extensive injuries, or permanent lodg-

\* *Le Gallois, Experiences sur les Principes de la Vie*, 8vo, Paris, 1812. Clift, in the *Philosophical Transactions* for 1815, Part I. p. 91. Philip, in the *Edinburgh Medical Journal* for January 1815. Knox, in the *London Repository*, Vol. VI. p. 275. Moulson, in the *Medico-Chirurgical Journal*, Vol. III.

ment of balls, give rise either to death, or to incurable paralysis. In a sergeant of the Enniskillen Dragoons, wounded at Waterloo, a piece of the shaft of a Polish lance stuck fast between the spinous processes of the two last dorsal vertebræ, completely paralyzing him until it was removed. In some cases we have to wait for the slow operation of exfoliation, if the spinous process be injured. Sinuses also are very apt to form along the spine, and they often prove very troublesome ; I would never trust to pressure in those cases, but make a free, though cautious, incision. These incisions are sometimes rendered very necessary by the lodgment of balls, pieces of cloth, &c.

Balls which pass along, or strike against the different bones of which the pelvis is composed, if discharged from a musket, rarely penetrate. Dreadful penetrating wounds and fractures, however, arise from round and grape shot. I have never witnessed a recovery from an injury of this description, nor have I seen one, where the performance of any operation, much less the application of a trephine, as proposed by Boucher in the Memoirs of the French Academy for 1776, could have been of use. The picking away of splinters, or other sources of irritation, is all that I have ventured to do in the few cases that have come under my care, trusting the remainder to proper regimen and dressings, and to the sanative powers of nature. It sometimes happens that balls

lodge in or near the bones of the pelvis, and sometimes they enter the cavity through the natural foramina, constituting wounds of a most dangerous tendency from the nerves, blood-vessels, and important organs which they injure. In some cases where a musket-ball has struck at point blank range, it has fairly penetrated the bone ; these cases are also highly dangerous, but there are some rare exceptions, in which neither immediate death nor paralysis take place. Mr Hammick, surgeon of the Royal Naval Hospital at Plymouth, was so kind as to show me a preparation made from a patient who had received a wound from a musket-ball, which passed through the right side of the sacrum, about three inches above the point of the os coccygis, and penetrated obliquely upwards. The ball was *passed by stool* in about two months after the infliction of the injury. The unfortunate man survived for two years, when, a discharge of feces coming on through the orifice in the bone, he died, exhausted by a complication of sufferings, but no paralytic affection ever appeared. A case, precisely similar to this, was seen in the Military Hospital at Berlin, under the care of Dr Reich, by my friend Dr Thomson. In a case of an officer of the commissariat, which occurred at Elvas, during the siege of Badajos, a ball passed through the sacrum, nearly in the same line of direction as in Mr Hammick's patient, and out over the symphysis pubis. Urine passed after the first few hours from the pos-

terior wound, and almost immediately from that in front, but no feces ever appeared at either, until a few hours before the patient's death. The intestinal gases, however, escaped in great quantities, and the smell was overpowering. No loss of motion appeared until the 3d day, when he expired, labouring under symptoms of the most violent peritonitis. On examination of the body, all distinction of parts was so completely obliterated, that the exact course of the ball could not be ascertained. Bordenave, in his paper so often referred to, and Andouillé, in the same volume of the *Memoirs of the Academy*, furnish some very interesting cases of gunshot wounds of the pelvis and spinal column. Dr Thomson lately met with a case where a musket ball had lodged in the ilium of a military officer, where it remained above two years, until violent inflammation having been excited by dancing, it was luckily discovered and extracted with considerable difficulty. A very large quantity of matter followed the extraction, and it was obvious that the ball had perforated the bone completely, and had been wedged into it, and confined the matter. The patient, who had been hectic, gradually recovered, and now enjoys perfect health.

Wounds of a most distressing nature, but fortunately not very common, occur in the perinæum, and in the organs of generation. In the first class, the elastic gum catheter is of the utmost assistance



to us. In the few cases which I have met with, a perfect cure was effected by its employment, together with that of small adhesive straps to bring the lips of the urethra together, and light easy dressings, particularly finely scraped dry lint, without the aid of any scarifications whatever ; the latter application, with an occasional emollient poultice, has generally brought the wounds of the genitals to a healthy state. In some instances, the scrotum has sloughed extensively, leaving the testis quite uncovered ; in others, the testis has thrown out, with great rapidity, a fungous protrusion. In some of these fungous cases, I have seen the whole tribe of escharotics employed in vain, and the ultimatum of castration has been adopted. This is a remedy often unnecessary, for, by removing the fungous growth with the knife, and cautiously dissecting away the excrescence in slices, until we come to the sound structure, the parts heal up with the usual dressings.

#### CONCLUSION.

It will be obvious, in the perusal of these sheets, how much I have trusted to DEPLETION ; but I beg to remind my readers that I have been describing the injuries of robust young soldiers, full of life and vigour, and fitted for all the purposes of active warfare ; living principally in the field ; enjoying few, if any, of the luxuries of domestic society ; and, consequently, exempted from

many of the diseases incident to the inhabitants of cities. A short absence from the army has, however, been often attended with a remarkable change in their constitution ; the men who were once in the hospitals in the rear, have almost constantly formed the great majority of their inhabitants afterwards. It may be said they were weakened by previous sickness. To a certain extent I admit the fact ; but the same cannot be said of the officers who remained in the Depôts, from duty or other causes, and who preserved their health there. These men could not bear the privations of the field ; they were subject to low typhoid febrile attacks ; they could not bear evacuations, either in their diseases or their wounds, to any thing like the extent of those more actively employed. The difference of success was so notorious, that the dépôt officers were consigned to certain death when they joined the army, by their veteran brethren ; but what military men deemed judgments, medical men accounted for upon physical principles.

The histories of unlooked for cures that have occasionally been effected in wounds of the various parts of the body, and that have from time to time been recorded, should render us cautious in pronouncing any injuries absolutely mortal, and should encourage us to persevere to the last in our efforts at relief. True it is, that those histories are more numerous in the earlier annals of our science, when miracles of surgery and miracles of medicine shed a mystic

glare around their professors, and distinguished them amidst the “palpable obscure” of a superstitious age ; but even in the present day, when the steady light of anatomy, of physiology, and all the collateral sciences, has illuminated the different branches of the healing art,—when the theorist and the speculator are neglected or ridiculed, and the fascinating mazes of fancy are abandoned for the more arduous paths of rigid inquiry and practical deduction, facts, singular and inexplicable, are daily offered to our notice. To rescue those facts from oblivion, is the duty of every man ; each reader or each witness may doubtless consider them with a bias perhaps unknown to himself, and involuntarily influenced by his own peculiar opinions, or by the particular point of view in which he sees them.

In the foregoing pages I have, as far as I was capable, divested myself of every prejudice, and been the faithful narrator of what I have seen. I have neither indulged in the visions of theory nor the intricacies of criticism, nor have I strained or distorted facts to serve a particular purpose ; and if I have contributed to fix one wavering mind, to illustrate one point of military surgery, or to advance in the smallest degree the interest of that branch of my profession to which my life is dedicated, I shall have obtained the full completion of my wishes.





## APPENDIX.

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I HAD proposed to subjoin to the foregoing pages a collection of forms of returns, invoices for field panniers, &c.—but I found it would swell the work, and be superfluous to the military reader, who must be furnished with most of those forms with his instructions, which can be useful to him alone. In addition to the official instructions, a most comprehensive code was promulgated to the army employed on the Peninsula by Sir James M'Grigor, in which was comprised a specimen of a *Pharmacopœia Castrensis*, to which I would refer the young surgeon as a guide, and the seniors as an example of what ought to be circulated to the hospital staff on all future occasions. I had also intended to give some outlines and descriptions of various inventions for conveying wounded men with fractured limbs from the field, particularly those of La Faye and Assalini, to be seen at large in the 2d vol. of the *Memoirs of the French Academy*, and in the interesting “*Manuale di Chirurgia*” of the latter author, Milan, 1812; but I found that I had considerably transgressed the bounds that I had originally intended. These inventions by no means preclude the necessity of the exertion of future in-

genuity. The great desideratum is a machine, by the application of which to the lower limbs, a wounded soldier may be conveyed on a litter or on horseback over rough or mountainous roads, until he can be placed in a proper waggon. Our English waggons on iron springs invariably produced the most exquisite agony to the wounded soldiers on the Peninsula. I myself was once conveyed in one of them while labouring under an attack of acute rheumatism,—but the recollection is even yet painful to me.

As I have made such frequent reference to diet, I shall, for the non-military reader, give the present improved scale of British Hospital Dietary, which I conceive to be the most perfect hitherto adopted in armies.

### *Diet Table.*

*For Full Diet.* Breakfast, one pint of oatmeal or rice gruel. Dinner, three-fourths of a pound of meat, one pound of bread, one-half pound of potatoes, one quart of table beer. Supper, one pint of oatmeal or rice gruel. *For Half Diet.* Breakfast, one pint of oatmeal or rice gruel. Dinner, one-half pound of meat, three-fourths of a pound of bread, one pound of potatoes. Supper, one pint of oatmeal or rice gruel. *For Low Diet.* Breakfast, tea. Dinner, one-fourth of a pound of meat, one-half pound of bread, one-half pound of potatoes. Supper, one pint oatmeal or rice gruel. *For Spoon*

or *Fever Diet*. Breakfast, tea. Dinner, one-half pound of bread made into panado or pudding, or sago. Supper, tea.

*Extras.* All extra diet must be stated and charged in the proper table of the periodical return, against the patient's name ; wine used in panado or sago, or in any other kind of food, must be similarly specified in the wine return. The fever or spoon diet is adapted to such cases as will not allow of any excitement from animal food, in the shape of broth, or otherwise ; and any extras to this rate of diet, are supposed to be given with the same view.

Articles composing the different diets for a day, avoirdupois weight. *Full*, meat twelve ounces, bread sixteen ounces, potatoes eight ounces, oatmeal three ounces, or rice two ounces, barley three-fourths of an ounce, sugar one ounce, salt one-fourth of an ounce, beer one quart. *Half*, meat eight ounces, bread twelve ounces, potatoes sixteen ounces, oatmeal three ounces, or rice two ounces, barley three-fourths of an ounce, sugar one ounce, salt one-fourth of an ounce. *Low*, meat four ounces, bread eight ounces, potatoes eight ounces, oatmeal one-half ounce, barley one-half ounce, tea two drams, sugar one ounce, salt two drams, milk two ounces. *Spoon or Fever*, bread eight ounces, or sago four ounces, tea four drams, sugar one-fourth of an ounce, milk four ounces. *Note.*—The meat is to be boiled, so as to make a pint of good

broth for the dinner of each patient, for which the barley is allowed.

When it shall be found necessary to put any patient upon a milk diet, it is to be done by giving a pint of milk morning and evening for breakfast and supper, in place of tea, the spoon or fever diet, and one pint for dinner ; and it will be expected, that medical officers be careful not to order any milk under the other heads of diet, or promiscuously, in case of disease, as in many it is not only unnecessary, but rather prejudicial ; while, in several of the sequels of pneumonia, and of syphilis, and in phthisis pulmonalis, as well as in hectic fever accompanying other chronic diseases, milk may be exhibited in the way above mentioned. If, on any other occasion, a medical officer shall think it expedient to order extra milk, a detail of the necessity will be expected, as it will also be when other extra articles are given ; the present table of diet allowing amply for almost all cases of disease and convalescence. During the period of convalescence, it is recommended to medical officers, to put the patients gradually upon such diets as approach nearest to their ordinary food in health, for much injury often arises, as has but too frequently been observed, from their passing at once from low, or even spoon diet, with either one, or perhaps numerous extras, to the usual food of a healthy man.

THE END.



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